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W. J. JOHNSTON, Editor and Publisher.

T. COMMERFORD MARTIN, JOSEPH WETZLER, Associate Editors.

CLARENCE E. STUMP, Business Manager.

WALTER T. HUNT, Advertising Dept.

New England Office, 178 Devonshire Street, Boston.
W. I. BARKER, Manager.

Western Office, 44 Lakeside Building, Chicago.
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The Pittsburgh Electric Railroad. WE publish on another page a very interesting illustrated article on the Pittsburgh and St. Clair Street Railway, which has been equipped on the well-known Daft system. A remarkable feature about this road is the tremendous grade which the cars are made to climb. Our illustrations and the article give some idea of the steepness of the route, upon which the maximum gradient is not less than 15½ per cent. As is remarked in the article, it is after a grade of 9 or 10 per cent. has been reached that the troubles of climbing become fully appreciated; but in this case the constructors of the road appear to be thoroughly satisfied that they have met and conquered all the difficulties involved.

The Court of Patent Appeals. IT will be seen, from the report which we publish elsewhere, that the judiciary committee of the House of Representatives has reported in favor of the bill for establishing a court of patent appeals. It is pointed out in the report that there are many good reasons for the establishment of such courts, and that the expenses would not exceed $30,000 per annum, a sum of money bearing no comparison whatever to the amount that will be saved in this case to inventors and owners of patents, by the speedy adjudication of patent issues. Point is given to this argument by mention of the fact that a balance is shown in the Treasury to the credit of the patent fund of nearly $3,500,000. We trust that success will now attend the endeavors made in this direction, and that the work done through and with the aid of the National Electric Light Association in bringing the subject to a head will not have been wasted.

Noisy Electric Light Stations. IN our columns will be found this week an important decision just rendered in the Supreme Court, Chambers, to the effect that a large electric light station in Harlem is a nuisance, and that after a suitable time allowing for its removal and reconstruction, its operation where it now stands must be discontinued. We cannot say that a visit to the station has impressed us with its noisiness, although perhaps various changes might have been introduced to run the machinery more quietly. If such a station is a nuisance, with its heavy work limited at most to three or four hours, it seems to us that it ought to be within anybody's power to close up the elevated road, on which the tremendous clatter and din is ceaseless, and becomes worse and worse from year to year. So far as we have been able to ascertain, the objections that have been raised against electric light stations by neighboring householders have been very few, and in many cases without foundation.

Collisions at Sea. IT will be remembered that just after the collision between the "Thingvalla" and the "Geiser," an article was contributed by one of our readers drawing attention to the desirability of electrical connection between vessels approaching each other at sea. It appears that the catastrophe has now given rise to active nautical controversy in England, of which our English correspondent sends some interesting notes. The suggestions made on the other side relate generally to the use of electric lights. One striking idea is that a holophote shall be placed on the bridge, and that the ray of light from it shall sweep over the water in accordance with the movement of the helm, so that a vessel at a distance can see whether the helm of the vessel coming has been ported or starboarded. Such a field ought to be very fruitful of good plans, and it is certainly about time that something practical and successful was brought out to prevent vessels crashing into each other when an early intimation would keep them wide apart.

The Cowles Aluminium Process. THE production of aluminium continues to attract no small amount of public attention in electric, engineering and metallurgical circles. Among the more important of the various processes tried for extracting aluminium, is that which is known as the Cowles, and which has now been in operation in this country for some time. This method of electrical smelting seems to possess a great many advantages, and the result of the work at Lockport has been that a second plant, on an equally large scale, has just been completed at Milton, in Staffordshire, England. This week we give illustrations and descriptions, not only of the electric furnaces themselves, as constructed in the English works, but of the 400 h. p. Crompton dynamo which has has been built for the purpose. This machine gives an output of from 5,000 to 6,000 ampères, at an E. M. F. of 60 volts, and is, we believe, the largest machine in the old world, just as the Brush machine at the Lockport works is the largest in America. It is stated that with the Cowles electric process, as now improved and simplified, aluminium alloys are produced at a greatly lower cost than is possible with any other method, and that, moreover, the expense of manufacture is to be again materially lessened.

Telegraph Operators Abroad. IT should not, we think, escape the attention of those who maintain the agitation for government telegraphs in this country, that so far as the operators themselves are concerned, there is as much discontent among them abroad as there is in America, although, perhaps, the feeling may not have manifested itself in so striking a manner. News recently received from France states that a meeting has been held in Paris by some 600 telegraphists, who have formed a fund for agitation purposes, and have appointed a committee to petition the post-office authorities for a removal of their grievances. Unless some redress is obtained from the evils complained of, a general strike is threatened. In England the same dissatisfaction with their condition under the government has been evinced by the operators from time to time, and Germany, with its severe military forms of discipline, has not proved altogether a paradise for government telegraphists. Any scheme proposed for settling the question must, we think, take into consideration the welfare of the operators, who would number at least 20,000 or 30,000, and hence it is well to bear in mind the status and sentiments of those in Europe who have already become public servants.

Utilizing the Sun. FROM time to time, as our readers are aware, experiments have been made to utilize the radiant energy of the sun directly in various ways. We illustrated in our last issue the method recently patented by Mr. Edward Weston, whose object has been to devise a plan in which the discontinuity of the sun's rays has practically no appreciable effect on the working of the apparatus. As will be noted, the arrangement includes storage batteries to which the electrical energy may be intermittently delivered, and from which it may be drawn as a constant source of supply. Doubtless to some, efforts in this direction seem visionary, but they are being prosecuted by men of first class ability and genius. In these days it is hardly safe to declare any scheme wild or impossible which is reasonably based on the laws and operations of nature. Some idea of the results to be obtained from such a method may be formed from the facts developed by Capt. John Ericsson, who, it is well-known, has been working on sun motors for some time. The results of protracted experiments with the Ericsson sun motor provided with reflecting sun mirrors have shown, it is said, that a surface of 100 square feet presented at right angles to the sun at noon in the latitude of New York during summer time, on clear days, develops a mechanical energy in the neighborhood of 1,850,000 foot-pounds per hour.

Electric Lights in the Suez Canal. AN interesting paper, read before the British Association by Mr. R. P. Sellon, dealt with the results obtained by the use of the electric light upon the Suez Canal. Since 1886, steamers provided with electric light plants have been allowed to go through the canal at night, in the manner which has been illustrated in our columns. The navigation of the canal at night in this way has proved a great success, as many as 139 steamers passing through by means of the electric light during May last, or 43 per cent. of the total traffic. This means to the Suez Canal Company an increase in the capacity of the canal of nearly 50 per cent., so that a traffic which has reached from 7,000,000 to 8,000,000 tons can be developed with ease up to eleven or twelve million tons per annum; while the Canal Company is left free to pursue works of importance with greater care and economy. As regards the individual steamers, Mr. Sellon shows that the saving in time approaches twenty-four hours in a single day. Taking the average saving effected by each vessel at from $350 to $400, the annual saving to maritime commerce amounts, at a minimum valuation, to close upon $500,000. Mr. Sellon calls attention also to the increase of personal comfort derived in escaping some of the heat and glare of the desert sand. In case of war, as he says, "a saving of 24 hours may entail consequences not easy to calculate"; and the same may be added with regard to mail matter. It was a happy thought of Mr. Sellon to bring out these figures, as they enable the public to realize tangibly the immense benefits which practical electricity is conferring on our day and generation.

Dynamo Building. IN our notices of new books this week, we have had occasion to speak of Lieut. Murdock's discussion of the various questions connected with the use of the dynamo on shipboard. It is pointed out that the demand in England and Europe for ship plants in the various navies and the mercantile marine has already led to the introduction of a very good class of slow-speed dynamos, while on the other hand no American firm or company has as yet constructed this machine for the trade, only a few special ones having been built at heavy expense. According to Lieut. Murdock, in this country, when a slow-speed dynamo is wanted, it is customary to fill the order by selecting the frame of one which nominally has double the required output and then running it at much less than the normal speed. Yet, as he says, this is not a slow-speed dynamo, but a high-speed machine at a reduced power, or, as he puts it neatly, it is like trying to pass a well developed man as a boy because he can do the boy's work. A table of figures is presented to illustrate the difference existing between European and American dynamos, and the fact is brought out that the highest outputs are shown by the slow-speed machines. If there be a lesson in this, as we think there is, our American dynamo builders will be quick to learn it, especially at a time when the development of our navy, and the continued growth of our domestic marine, gives a field for the exploitation of a new type. The American work that has been done in this direction is of the utmost promise, and it is noteworthy that, in the table which is spoken of, an American machine—the Bradley stands at about the top in a list of some 23 machines, half of which are of foreign make.

NEW BOOKS.

NAVAL RESERVES, TRAINING AND MATERIEL. General Information Series, No. VII. Office of Naval Intelligence (Lieut. R. P. Rodgers), Navy Department, Washington. 1888. 432 pp.

The value of the annual publications of the Office of Naval Intelligence has long been appreciated, and the issue for 1888, as above, must be regarded as one of the most important of the collections of papers that have issued from our government bureaus. Now that we have a navy in some degree worthy the name, the question of equipment arises, for unless the outfit of our men-of war be such as to embody all the latest advances and improvements, we might as well go back to the time when we were almost entirely without floating defenses for our long lines of coast. In this matter of equipment, electricity plays more and more a leading part, and it is the section in this book on the application of electricity to various uses on shipboard that specially interests electricians.

The chapter in question, prepared by Lieut. J. B. Murdock, U. S. N., not only presents an excellent survey of the subject historically, but enters into an elaborate consideration of some highly practical details.

The first subject to which Lieutenant Murdock devotes his attention is, naturally, that of ship lighting, and he discusses the manner in which ship plants can best be made to answer all the requirements of compactness, lightness, strength, interchangeability, simplicity, economy and efficiency. The system of direct connection for engine and dynamo, he says, commends itself by its simplicity and good mechanical arrangement. As to the type of dynamo, the most desirable for the purpose is a slow-speed compound machine. Lieutenant Murdock reports that European experience shows this combination to be more thoroughly adapted to the peculiar conditions of naval use than any other yet devised. With a plant of this kind search lights, incandescent lights and motors can alike be operated, saving space and avoiding duplication of apparatus. The Bradley multipolar dynamo, illustrated last year in our pages, is instanced as a good type of machine for the purpose, while illustrations are also given of the Sawyer-Man plant on board the steam yacht "Restless," where friction gear is used. As regards engines, Lieut. Murdock cites the Westinghouse as the best representative of high-speed, double cylinder, single acting engines, suitable to naval work. During 3 months of the test of this engine at Newport, it ran 22 hours daily for 6 days in the week, and the only mishap in a period of 7 months was the breaking of one of the cylinder safety plugs. Lieutenant Murdock also mentions the interesting fact that a United States (Weston) compound dynamo in the Torpedo Station had been in operation 2,650 hours without any mishap traceable to the dynamo. A section of this chapter is devoted to the electric motor, which is strongly recommended as a substitute for the small steam engine on board men of war. On the ground of utility, Lieutenant Murdock says, the motor possesses decided advantages, and these appear to exist equally with respect to economy. "Apart from all advantages of distribution the electric motor is the most efficient, compact, noiseless and simple vehicle for the transmission of energy that is known. If well made it requires only ordinary care and attention to be always ready for use. Its principal danger on shipboard is from salt water; but with proper care, this is small." Other portions of the chapter are devoted to the various subjects of signaling, secondary batteries, thermostats, Leclanché cells, etc., and altogether, with its summary of what has been done abroad, and its suggestions of what may be done at home, it is one of the most interesting and useful treatises that we have read in a long time. Many other parts of this book will be found of interest to electricians, especially those relating to torpedoes, and the use of search lights; and its appearance may be taken as a sign that when our naval officers have at last fleets to sail, they will know how to handle them in the most scientific and successful manner.

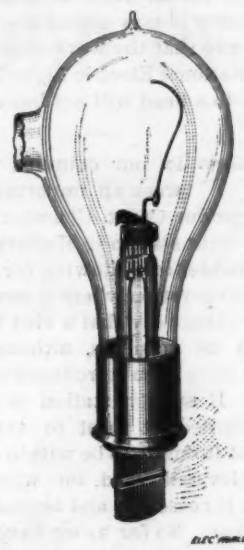
PROCEEDINGS OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION. Detroit, Philadelphia, Boston and Pittsburgh meetings. *Modern Light and Heat*, Boston, Mass. Two volumes, 546 and 588 pp.

These two volumes comprise the proceedings of the National Electric Light Association at the Detroit, Philadelphia, Boston and Pittsburgh meetings, and may be characterized as very useful additions to the literature of electricity. It is a pity that so much delay occurred in the publication of the older portion of these proceedings, but the arrearages have now been wiped out, and from this time all the transactions of the Association will doubtless appear promptly. Turning over the pages of these two comely volumes, it is interesting to see how new subjects have from time to time come within range of discussion. So recently as at Detroit, the electric motor was a new thing in its practical relations; and it is not till the following meeting at Philadelphia that we find the alternating current system coming into notice.

DYNAMO-ELECTRIC MACHINERY. Third Edition. By Prof. S. P. Thompson. E. and F. N. Spon, London and New York. 672 pp. Illustrated. Price $6.

It is with the greatest pleasure that we hail the issuance of the third edition of this magnificent work on the subject of dynamo-electric machinery. It is a book which must find an honored place on the shelves of every electrical engineer, and no man ought to consider himself familiar with the theory and practice of dynamo-electric construction who has not studied its contents. We do not care from what standpoint the book is discussed or criticised; it will be found a masterly production, every way trustworthy and instructive.

We take it for granted that our readers are acquainted with the earlier editions of this book, and we are not less confident that they will hasten to secure the present one, which is greatly improved over its predecessors, and which also includes a large amount of additional information. Among the amplifications may be mentioned some new historical notes, together with an outline of the system of electrical and magnetic units. The most radical change in the make up of the work is that which develops the theory of the magnetic circuit, in Chapter XIV., and which includes all that is of value in the work of Kapp,



A "BLOWN OUT" INCANDESCENT LAMP.

Rowland, the Hopkinsons, Vincent, Lord Elphinstone and others. Another improvement has been the separation into two categories of continuous current machines and alternating current machines, while Chapter XXV. has an addition devoted exclusively to transformers. This last chapter, it may be noted, embraces not only transformers of the ordinary type, but also continuous current transformers, together with a short note on the theory of motor generators.

The last seven chapters deal in a very able manner with the dynamo as a motor, discussing the theory of the subject as well as that of the transmission of power, and giving details as to a large number of leading motors that have been designed or are now in use. Chapters XXXI. and XXXII., dealing with the government of motors and the testing of motors and dynamos, are particularly good. The book includes, as in the previous edition, a number of

THE BOISSIER PLATING MACHINE.

appendices, the chief new one being an abstract of the theoretical researches of Clausius. The interesting subject of the use of the dynamo in telegraphy also comes under notice as an appendix, but by no means as fully as it deserves. We expect to see this topic, which is one rapidly growing in importance, in this country at any rate, far more fully treated in the next edition of the book.

So thoroughly has this work been revised, rewritten and enlarged that it is practically new, and is the one which, of course, will be cited in all subsequent references and quotations. This is a further reason why our readers should hasten to secure it.

Peculiar Breakage of an Incandescent Lamp.

We illustrate on this page a lamp which has been brought to our notice by Mr. C. G. Young, superintendent of the Mount Morris Electric Light Company in this city. It is a series Schuyler lamp, and was used in the company's station A. It was designed to run on a current of 9.7 amperes, and was of 50 c. p., with a voltage of 13. It had been running about 100 or 125 hours and gave no signs of weakening, when the filament suddenly broke and the glass blew out as shown, instead of blowing in. It will be remembered that we have illustrated a Bernstein series lamp in which the rupture of the filament caused a blowing in of the glass, and an Edison in which it caused a blowing out and protrusions of the bulb.

A New Electro-Plating Dynamo.

We illustrate, on this page, a new Boissier dynamo for electro-plating, etc., which has just been introduced by Mr. Hermann Boissier, the general manager and electrician of the Arnoux & Hochhausen Electric Company, of this city. This machine stands a height of 24 inches, and occupies a floor space of 16 by 26 inches. No. 1 size is calculated to run 440 gallons of nickel bath, and requires only 1½ h. p. to drive it. One of the electro-platers who has it in use is running with that size of machine, 9 vats containing 373 gallons of solution, with excellent results. The armature is solidly constructed of iron, and has the Siemens winding. A noticeable feature is the construction of the brushes, which are given much greater life than usual by the use of a slip of copper at the bottom of the brush, made twice as long as the upper layers. In this way, the principal part of the brushes does not come in contact with the commutator, but only the lower part wears off by the friction, and is from time to time pushed forward. The upper strips are kept in the same position all the time. In this way the brushes are practically made to last for years. This machine, although designed and built for electro deposition, is also arranged for lighting, and will produce 25 16 c. p. incandescent lights. In order to change the machine for arc or incandescent lighting, the upper curve of the horseshoe, which is bolted to the top of the machine, just above the two field magnet coils, can be removed and the spools can be changed according to the nature of the work they are to do. In the same way, the pulley end of the armature bearing can be taken off, and the armature similarly changed. The machine is substantially built, and is extremely simple in its operation. We understand that it is to be exhibited this Fall at the American Institute Fair, driven by the gas engine of the American Meter Company, of this city.

Telegraphers' Mutual Benefit Association.

The annual meeting of the Telegraphers' Mutual Benefit Association will be held in the Western Union Building, 195 Broadway, at four o'clock on Wednesday, Nov. 21, 1888. The following amendments to the Constitution and By-Laws have been proposed and will be submitted to the meeting:

It is proposed to amend Section 1, Article 3, of the Constitution so that it shall read:

"The officers of this association shall consist of a president, a vice-president, a secretary, a treasurer and a medical director."

And to add to Section 1 of the By-Laws the following clause:

"The medical director shall examine and make recommendations upon all applications for membership."

It is proposed to amend Section VII. of the By-Laws so that it shall read as follows:

"Any person of good moral character, who has forfeited membership through non-payment of dues, may be restored to membership upon the same terms and conditions as are required of new applicants, except that the entrance fee shall be four dollars, and that such applicant for restoration shall not be rendered ineligible to membership by reason of not being in telegraphic service."

And to add to Section VI. of the By-Laws the words:

"Except that such applicant for restoration shall not be rendered ineligible to membership by reason of not being in telegraphic service."

An Evasive Answer.

To the Editor of The Electrical World:

SIR: We have read your remarks respecting our Mr. Shippey's new lamp with much amusement. Permit us to say he will return to England early next week, when we have no doubt he will be able to give you all the information you desire.

In the meantime we send you specification of new lamp which has been patented by him, under which we can make most beautiful lamps of 100 to 1,000 c. p., which in due course, we have no doubt, you will inspect with interest when you see them running on several 110 volt circuits in the States, where at an early date they can be inspected in actual working. In the meantime, please insert this letter in your next issue, after which a full account will be forwarded to you.

LONDON, ENG. SHIPPEY BROTHERS, Limited.

[It will be observed that this letter furnishes no information whatever as to the wonderful patent convention alleged by the firm in its circulars to have been held in Washington.—EDS. E. W.]

Electric Transmission of Power for a Swiss Wire-Rope Railway.

We referred last week to a wire-rope railway or tramway line on the side of the Burgenstock, for which electric plant is employed to transmit energy from a waterfall three miles away to the hauling station at the upper end of the line. This undertaking is important to electricians and engineers because of the novelty and skill which have entered into its accomplishment, and because of the extraordinary difficulties which have been surmounted. Hitherto it has been considered impossible to construct a funicular mountain railway with a curve, but the new line up the Burgenstock has achieved that feat under the superintendence of Mr. Abt, the Swiss electrical engineer. The rails, in fact, describe one grand curve formed upon an angle of 112 degrees, and by an arrangement of wheels for the cars known as the "System Abt," the journey is made as steadily and smoothly as upon any of the straight funiculars previously constructed. The Burgenstock being almost perpendicular, it would have been impossible to construct a railway upon the old plan. A bed has been cut for the most part out of the solid rock in the mountain side from the shore of the Lake of Lucerne to the height of the Burgenstock—1,330 feet above its level, and 2,860 feet above the level of the sea. The total length of the line is 938 metres, and it commences with a gradient of 32 per cent., which is increased to 58 per cent. after the first 400 metres, and this is maintained for the rest of the journey. A single pair of rails is used throughout, with the exception of a few yards at half distance to permit the two cars to pass. Through the opposition of the Swiss Government, each car is at the present time only allowed to run the half distance, and they insist upon the passengers changing, in order, they say, to avoid collision or accident.

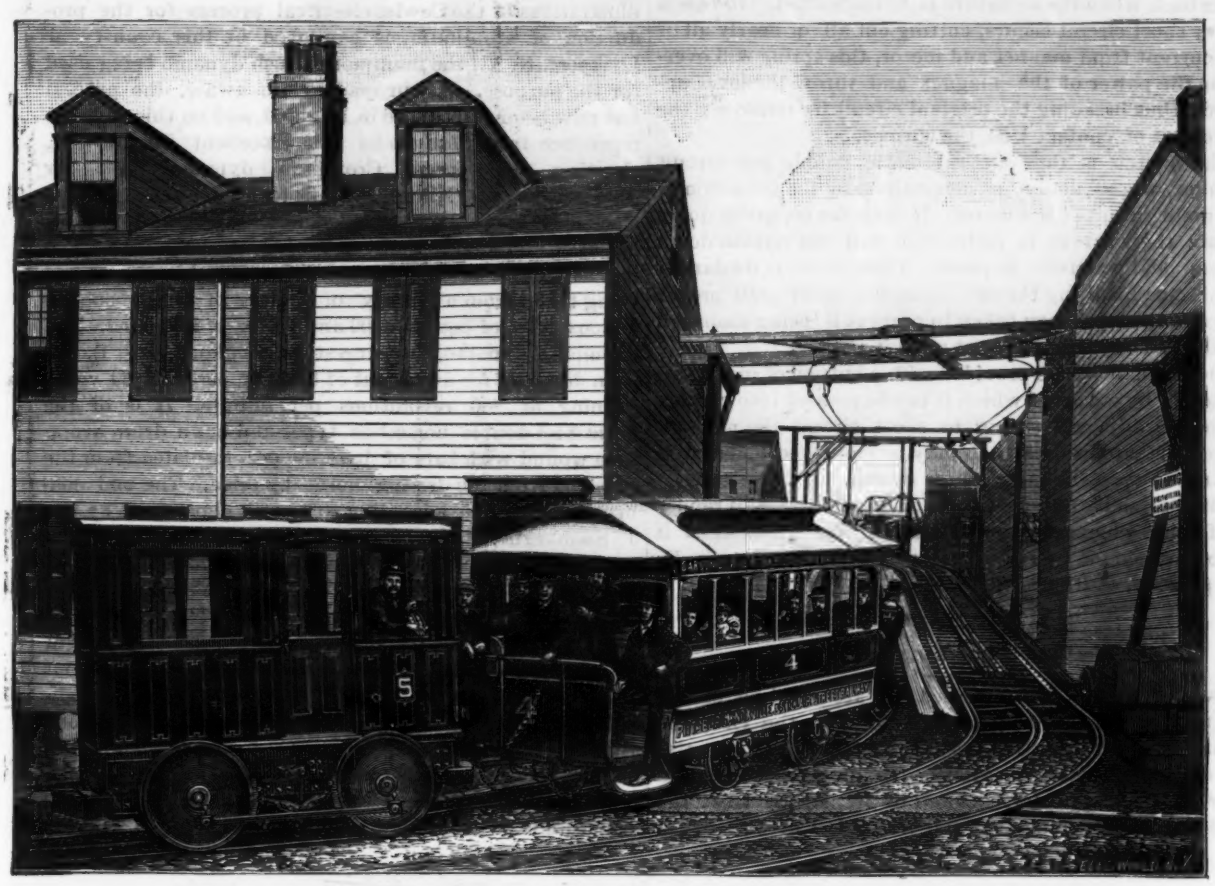


FIG. 1.—CAR STARTING ON GRADE, PITTSBURGH ELECTRIC ROAD.

The current is generated by two dynamos, each of 25 horse-power, which are worked by a water-wheel of 125 horse-power, erected upon the river Aar at its mouth at Buochs, three miles away. The current is conducted by means of insulated copper wires to a pair of electric motors, of the same power, which are placed at the head of the railway. The loss of energy in transmission is estimated at 25 per cent. The motors are connected by leather belting with two large pulleys on a countershaft, which is connected with a set of movable conical cogs, from which the big wheel over which the wire rope passes is driven. To give the rope adhesion it is wrapped under and over two smaller pulleys, and then for a second time over the larger wheel. The arrangements for applying the power are of the simplest character. Only one man is required to manage the train, and the movement of the cars is completely under his control. One dynamo is sufficient to perform the work of hauling up and letting down the cars containing fifty or sixty persons. With a switch the conductor regulates the amount of current according to his requirements. He communicates by electric signals with the man at the water wheel when the cars are about to commence their journey, and the latter in turn regulates the water-power applied. A finger moving along a figured disc before him, by means of a millimetre screw, at the rate of a milimeter to every metre of the railway, enables him to see the exact position of the cars on the line at any given moment of the journey, and he can increase or slacken speed accordingly. In addition to this the cars themselves give him a signal at stated points. For instance, at a distance of 1 metre and 15 metres respectively after the car leaves either the upper or the lower station, the flanges of the wheel pass over an electric plate, and a bell is rung in the machine room. The same signs are given when they arrive within 15 metres and 1 metre of the half distance, so that the cars are themselves their own signalmen, and the driver knows exactly when to shut off power. At the end of the journey, completed in about fifteen minutes, at an ordinary walking speed, the car moves gently against a spring buffer, and is locked by a lever without noise and without jolting the passengers.

The interesting undertaking has been carried out at a cost of £25,000. The water-wheel is also employed to light the whole of the hotel buildings and its grounds by electricity, and when the railway is not working, another dynamo pumps up spring water a thousand feet for use in the establishment. The London *Electrician* says: We gather that the motors derive their current from a set of accumulators at the station and not directly from the dynamos. This arrangement would probably be adopted not only for the sake of economy in the mains, but also to avoid possibility of accident arrising from an interruption of the charging circuit.

A Decision as to The Rapid Telegraph Property.

In the suit of the Boston Safe Deposit and Trust Company against the Bankers & Merchants' Telegraph Company and the United Lines Telegraph Company to aid a foreclosure suit and have certain telegraph property to which some of the defendants lay claim subjected to the operation of the decree, Judge Wallace of the United States Supreme Court rendered an important decision on Sept. 19. The trust company is Trusteee of a mortage made by the American Rapid Company to secure $3,000,000 of bonds according to an agreement made with the Bankers & Merchants' Company Aug. 28, 1883, to cover all existing or to be acquired lines of the American Rapid Company. Default having been made in the payment of the interest on the bonds, the complainant filed a bill for foreclosure in Connecticut, where the mortgagor is located. The Bankers & Merchants' Company created a mortgage Nov. 24, 1883, to secure $10,000,000, in which the Farmers' Loan and Trust Company is Trustee, and the claim of the defendant, the United Lines, was derived by purchase upon foreclosure. Judge Wallace says:

"The complainant is entitled to a decree if the mortgage made by the American Rapid is prior to that made by the Bankers & Merchants' Company. There was nothing improper or dishonest in the action of the Rapid stockholders. It is entirely legitimate for stockholders to get all they can for their property. The Bankers & Merchants' Company probably thought the property was worth all it cost. It got besides an established business and removed a rival. There is no evidence of bad faith toward the Rapid stockholders, although the ten-million-dollar-mortgage bonds were floated at what now seems an extravagant figure, and no proof that either designed to defraud the public. The claim that the Bankers & Merchants' Company created a mortgage to delude the public into belief that it was a first lien and that the Rapid Company's stockholders knew of the scheme has no apparent foundation. There is no question as to the priority of lien of the respective mortgages. As between equal equities priority of time will prevail. The United Lines' purchase was not bona fide. It had notice of complainant's claim when it purchased the property. A decree is ordered for the complainant, and a reference, if necessary, to estimate the property of the Reconstructed Lines."

Daft Motors on the Pittsburgh, Knoxville & St. Clair Street Railway.

The striking illustrations which "adorn the tale" following, merit a far more detailed and compendious description than the ordinary proportions of a passing notice will allow, and it must be of necessity confined to such of the more salient points as can receive suitable mention. The road itself is two miles long, with a minimum curve

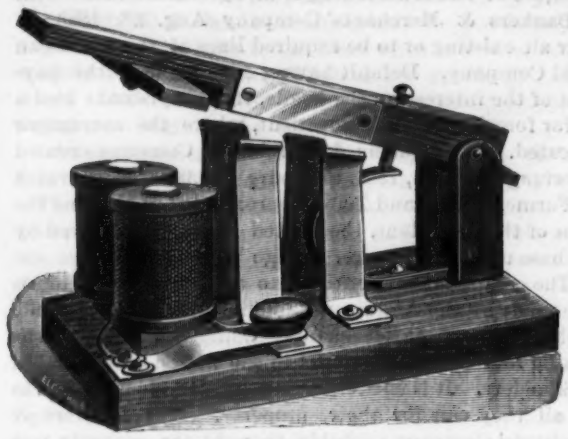
FIG. 2.—CAR ON GRADE, PITTSBURGH ELECTRIC ROAD.

radius of 37 feet, and a maximum gradient of $15\frac{48}{100}$ per cent., and exhibits the unusual feature of making use of both overhead and underground conduction. Fig. 1 represents a train, having just left the overhead system, halting to make connection with the underground.

The motors are of 35 h. p., 5 feet wheel base and 6 tons weight, and traverse with ease, under full load, gradients which the foregoing data at once establish as the most extreme of any railway in the world using locomotive traction, excepting those of the line through the Rigi Pass in

the Swiss Alps, and that up Mount Washington in this country. Each of these has its special device for securing sufficient adhesion to the rail, as has also the Pittsburgh railway. In this latter case it consists of a sprocket wheel, geared by an endless chain to the driving axle of the motor, and engaging, at the will of the driver, with a perforated steel band or rack spiked to the ties midway between the rails. With this in use no degree of iciness or muddiness has ever embarrassed one of these motors.

Fig. 2 will make perhaps a deeper impression than the bare statistics of the case. It shows a motor drawing a



THE SHEPARDSON MOTOR CUT-OUT.

carload of passengers over a portion of the line whose profile is represented in Fig. 3. The atmosphere of Pittsburgh is said to possess a wonderful influence in developing gradients, after their first measurement, and ascents have increased there three or four per cent. in less time than it takes to write about them. In order, therefore, that those quoted, which have been disputed, should not seem to have been observed through the peculiar local atmospheric medium, or their dimensions taken to be mere matters of estimate and opinion, careful instrumental measurements of them have been made by Mr. W. G. Wilkins, a civil engineer of the Pennsylvania Railway, who embodies his report in shape of the profile shown in Fig. 3, and supported by an affidavit, which we have had the pleasure of seeing for ourselves.

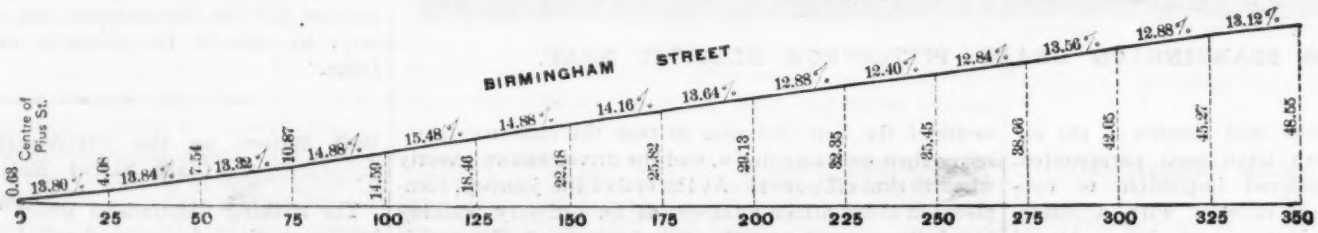


FIG. 3.—PROFILE OF THE DAFT ELECTRIC ROAD, PITTSBURGH, PA.

From station 0 a curve of 50 feet radius extends 77 feet up the incline, which contributes materially to the difficulty of ascent. As may be seen in the profile, the maximum gradient, 15.48 per centum, occurs between stations 100 and 125.

It is not commonly appreciated that a trifling increase in gradient, after passing a certain limit, by no means expresses, in numerical ratio, the difficulties of the problem. This limit falls between 9 and 11 per cent., which include the point at which adhesion between wheel and rail ceases to be a trustworthy factor in the calculation, and introduction of special means for securing it becomes a necessity.

Even 1 or 2 per cent. above that limit imply as great an obstacle as five or six below it, and the problem assumes an entirely new complexion. It has, however, been considered to be satisfactorily solved by the Daft system on the St. Clair Street Railway, of Pittsburgh, which maintains a schedule speed, invariably upon level and gradient, of 6 miles an hour over a roadbed including the difficulties described.

An Improved Motor Switch.

It is well known that in the practical operation of electric motor systems, heavy short circuits are liable to occur, which cause a great diminution or a practical cessation of the current on the main lines. Other causes may bring about the same result, thereby effecting a stoppage of one or more of the motors in the system. Now, the disturbing cause may be suddenly removed, either accidentally or by workmen sent for the purpose, in which case the motor will again receive the full current while at rest. This has been found to be a fruitful source of danger to motors, armatures and fuses being burned out or other damage following. Of course, it has been common to place switches in motor circuits, but it often happens that the attendant is careless or ignorant of what should be done, or that he is unable to open the switch before the current is on again.

The Shepardson switch, illustrated on this page, acts automatically, so that the moment the current in the mains ceases, the motor circuit is interrupted, and it cannot again be permanently closed until the current is again restored. The circuit passes from the generator to the small hand switch, thence through the magnet to one of the contact springs, through the plate on the side of the lever to the motor and back to the spring plates on the opposite side of the lever, and finally to the generator. This is the normal circuit when the motor is running without interference; that is to say, the magnet is in series with the motor and normally holds its armature down to the poles, thus maintaining the circuit complete. It will be observed that the armature lever is pivoted, and that an adjustable spring is provided for throwing the lever back when the armature is not attracted. In case a heavy short circuit occurs, cutting out all or nearly all of the current from magnet and motor, this spring will overcome the power of the magnet and threw the lever upwards, thus breaking the original circuit by removing the plates out of contact with the springs.

The switch is thus an automatic double pole circuit breaker, whose action is determined by the condition of the main circuit of the motor. If the lever is pushed down before the current is restored, it will not remain down unless held positively in place. Thus there is no danger of the current being thrown upon the motor until proper precautions have been taken to prevent it being damaged by the full current being put upon it at once.

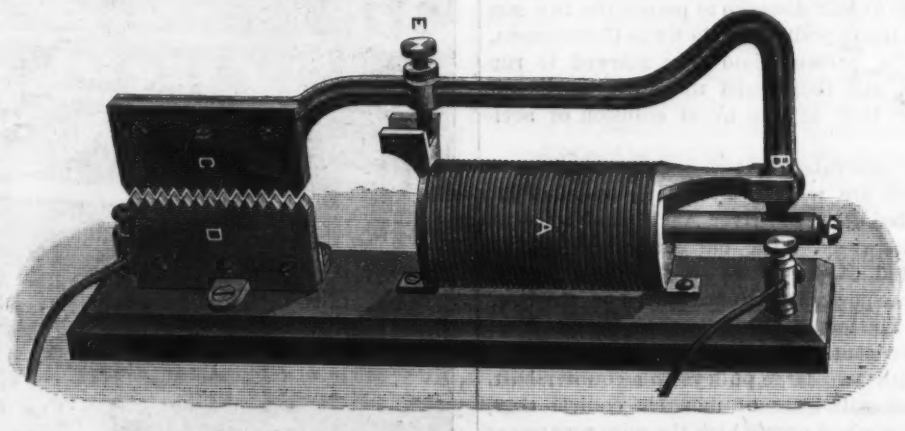
The hand switch is provided with a button of insulating material, by means of which it can be pressed into contact with the adjacent spring to short circuit the magnet. This short circuiting switch may be employed when it is desired to open the main motor switch.

The simplicity and cheapness of this switch will render it of value wherever a motor is used, We understand it is to be exploited by the inventor himself, Mr. George D. Shepardson, of Ithaca, this State.

The Law Lightning Arrester.

Overhead wires, whether used for arc lighting or for the transmission of energy, are exposed to the effects of lightning, which may not only destroy the lines but also the dynamos, motors or lamps. To protect the plant a Law lightning arrester, devised by Mr. M. D. Law, the well-known superintendent and electrician of the Brush Company, of Philadelphia, has been found to work successfully. All lightning arresters are based on the principle that a lightning discharge can leap a small break in the circuit to the earth, which to the working current is impassable. It must be remembered that the E. M. F. of arc light circuits is very high, and that if an arc is formed between the points of a lightning arrester, the E. M. F. is high enough to sustain it after the lightning stroke has passed, and thus not only damages the protector but may start a fire or destroy the dynamo. To prevent this the Law arrester is employed, which automatically ruptures the arc.

In the accompanying illustration *A* is a hollow-cored electro-magnet with the inner end of the wire connected



THE LAW LIGHTNING ARRESTER FOR DYDAMOS.

to the metal casing of the coil and the outer end to the line. The core of the magnet is pivoted to the curved lever *B*, which has at its lower end the saw-toothed carbon plate *C*. Below this is another similar carbon plate *D*, which is connected to a good ground connection, The two carbon plates are kept apart the proper distance by the adjusting screw *E*. If these plates are from one-sixteenth to one-eighth of an inch apart, it is evident that the lightning stroke will pass from the plate *C* to *D*, and thence to the ground. But in its passage the dynamo current follows it, which instantly energizes the magnet, and this automatically raises the carbon plate *C*, rupturing the arc; when the plate immediately returns to its original position and is ready for the next stroke.

These arresters have been used through several heavy thunder storms during the past summer, and have been found to work perfectly. Every line that was supplied with them was thoroughly protected, while the dynamos on the lines not protected were very roughly handled, burning out the insulations and armatures.

The Cowles Alluminum Process in England.

From time to time we have published descriptions and illustrations of the Cowles electrical process for the production of aluminum, as employed in this country at Lockport, N. Y., the mammoth Brush dynamo being used for the purpose. As our readers are aware, the process has now been introduced in England, and on this page we reproduce from *Industries* two excellent illustrations, showing the special Crompton dynamo built for the works at Milton, Staffordshire, and of the electric furnaces there. At Lockport, water-power is used, but at Milton a large Pollit & Wigzel compound condensing horizontal tandem engine drives the dynamo, steam being taken from a battery of boilers of the Babcock & Wilcox type, of between 500 and 600 h. p. indicated. The Crompton dynamo, the largest in England (Fig. 1), has been designed for an output of 5,000 ampères at 60 volts, running at 380 revolutions per minute. It is of the horizontal double horseshoe type, and has a drum armature wound with bars of bare copper insulated from the core and from the driving horns by mica. The end connections are made according to a method patented by Mr. J. Swinburne. The conductor is three-eighths inch by seven-eighths inch, and the 128 bars are connected to 64 commutator strips by screws. The bars are placed edgeways on the core and are connected in groups of four, so that the winding is equivalent to that of an armature with 32 sections and 16 commutator strips. Even with this subdivision there is heating, but it is entirely within safe limits, although the machine runs night and day, coolness being assisted by air blast from a Schiele fan. The output sometimes rises as high as 6,000 ampères. The core of the armature is 20 inches in diameter and 36 inches long. The magnets are 37 inches by 6 inches in cross-section, and are compound wound, with the main winding preponderating. The machine is almost pure and simple series, but a shunt has been added to facilitate the starting when, with the furnaces cold, the resistance in the external circuits is large. The shunt coils are wound on the yokes, and the series coils on the horizontal limbs of the magnets, there being four turns on each limb, but only three of them in circuit. Each shunt coil is of 250 turns, and the shunt current is 50 ampères when in regular work. In the furnace house there is a rheostat by which the men there can within certain limits, vary the shunt current and the pressure; and, to facilitate quick starting, there is a switch on the dynamo for throwing the two shunt coils in parallel. The main coils are all in series, and the full exciting power is about 42,000 ampère turns. The current is taken off by four brushes on either side, the brushes being attached to the large ring shown in the cut, and by means of the insulated lever can be shifted during the run to the non-sparking point. The smaller ring surrounding the commutator serves as a strengthening piece to the sections, which, owing to their great length, require some additional support. The current, on being generated, is led by copper bars to an enormous cut-out, and thence to the furnaces in the adjoining room. A huge current indicator is inserted into the circuit in order to enable the attendants at the furnace to judge of the progress of the operation, and to keep the

current within certain limits, by adjusting the distance between the electrodes. The indicator is simply a solenoid of nine turns through which the current passes, and into which is placed an iron core suspended from a spring. The movement of the core is made visible by a pointer playing over a large dial, and the axis of the pointer is carried through the wall, so that the indications are repeated on a second dial in the engine room. The electrodes can be withdrawn or advanced by means of a screw and handle, and a boy on each side of the furnace watches the current indicator and manipulates his electrode so as to keep the current as uniform as possible. The construction of the furnaces is exceedingly simple. Each furnace is a rectangular pit, constructed of fire-clay, and provided at either end with an inclined cast-iron pipe, through which the electrode is introduced, as will be seen on reference to Fig. 2, which represents a nest of furnaces in one of the furnace rooms. The current is supplied by the two copper bars running horizontally across the furnaces, and by flexible cables, which can be clamped to the bars in any desired position. Only one furnace is running at a time, the other furnaces being meanwhile either charged or left to cool. Each electrode is a bundle of from seven to nine carbons (each 2½ inches diameter), round which is cast a cylindrical head of iron when ferro-aluminum is to be produced, or copper when aluminum bronze is to be produced. A stout copper rod is attached to the centre of the head, and projects through the cover of the cast-iron pipe already mentioned, and to the outer ends of these rods are clamped the flexible cables which depend from the omnibus bars overhead.

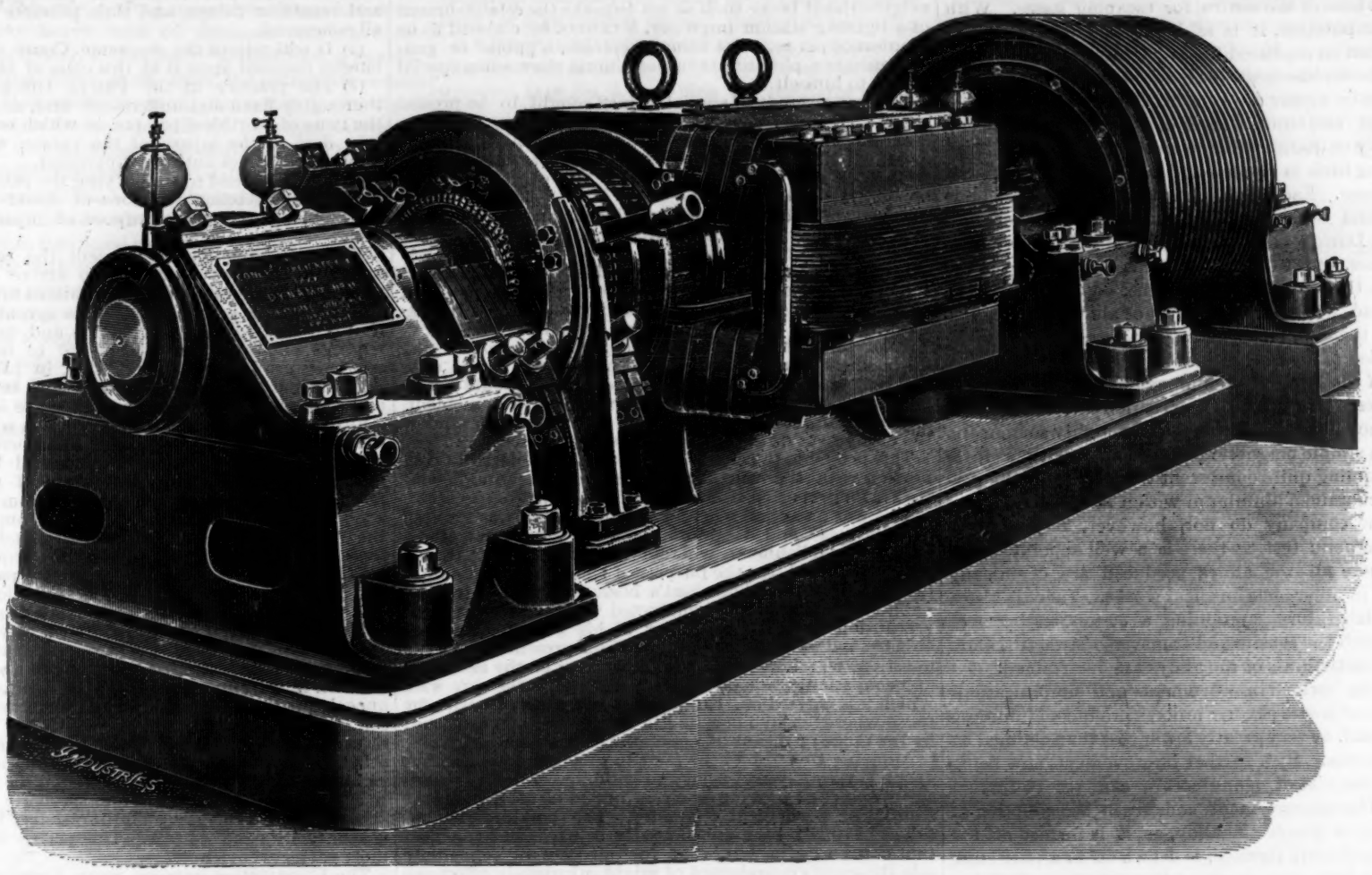


FIG. 1.—THE CROMPTON DYNAMO FOR THE COWLES ALUMINUM PROCESS.

The furnace is charged as follows: On the bottom is thrown a layer of limed charcoal. The electrodes are then inserted, and two pieces of sheet iron are connected by stirrups, forming the sides of a bottomless box, and serving as a receptacle for the charge of ore, metal and charcoal. The spaces between the walls of the furnace and the sheets of iron are filled in with charcoal and then the

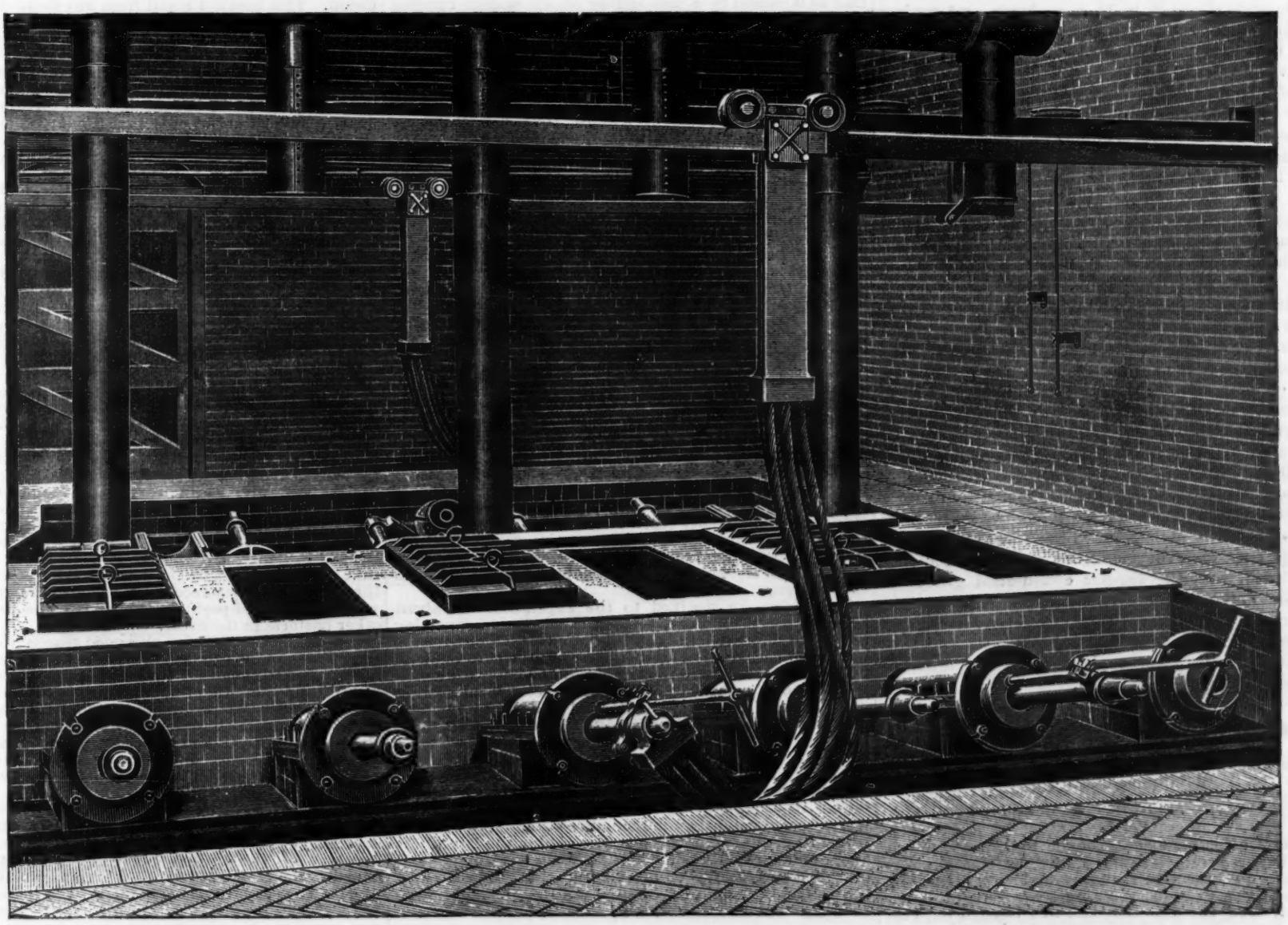


FIG. 2.—FURNACES IN THE COWLES ALUMINUM PLANT, MILTON, STAFF., ENGLAND.

sheets are withdrawn. A few broken pieces of carbon are put in so as to bridge across between the electrodes, and the whole charge is then covered with a top layer of charcoal. The furnace is closed with a cast-iron cover, with a vent hole in the centre for escaping gases. With careful manipulation, it is said, one pound of contained aluminum can be produced for every three pounds of ore used. By the intense heat, the reduced aluminum and the alloying iron or copper are volatilized and are condensed in the upper and cooler layer of charcoal. There they form a nearly or quite true chemical compound, the liquid alloy running back in rivulets and collecting at the bottom of the furnace. Each run lasts usually about an hour and a half, and each furnace is successively called into operation. During the run a little aluminum escapes with the gases, and to catch it a pipe is placed over the hole, so that these products of combust on go to a settling tank overhead, whence the fine dust of aluminum oxide is periodically taken to be treated again.

The addition of aluminum to iron changes the magnetic properties of the latter to such an extent that with 17 per cent. the "ferro" mixture becomes non-magnetic. This quality of the alloy is made use of for roughly sorting the product by a simple magnetic test, the men with a little practice becoming quite competent to determine the percentage of contained aluminum with a fair degree of accuracy. The company do not, however, rely entirely upon the magnetic test, as there is a well appointed laboratory, where all the alloys produced are chemically analyzed, as in other metallurgical works. There is also a mechanical laboratory containing a 30-ton testing machine, by which the tensile and transverse strength, elongation and elastic limit of the alloys are determined.

Owing to the various improvements and simplifications introduced, the Cowles electric process produces aluminum alloys, it is said, at very greatly lower cost than claimed by any other process. By a further improvement, now being carried out, the cost of manufacture can yet be further lowered. This improvement consists in the adoption of a tap furnace, in which the alloy, as it is formed at the bottom of the electric furnace, is drawn off in a pure state through a tap hole, very much as in a cupola. Such tap furnaces have already been erected, and have been for the last three months practically at work night and day in the Cowles Company's Works at Lockport, New York. and it has been found possible to very materially reduce the cost of manufacture by this means. The electrical energy required for the production of one pound of contained aluminum, varies of course with the grade of the alloy. For very high grade alloys it is 15 h. p. hours, and for low grade alloys it may rise to 30 h. p. hours, the average being about 22 h. p. hours.

We have now described the most important parts in the process of manufacture, and will saya few words about the auxiliary processes of preparing the materials and recovering waste. The charcoal is ground to a powder under a pair of edge runners, then sifted and soaked in a weak solution of lime. After drying it artificially, it is ready to be charged. The charcoal used in a previous charge, and which has been partly changed to graphite, is treated in a similar manner, and thus used many times over. The dust of alumina collected from the settling chamber is charged again with fresh ore, and thus utilized. The residue of metal in the refining furnace is also saved. After the charge of this furnace, which amounts to from 15 cwt. to 20 cwt., has been tapped off, the slag, consisting principally of a mechanical and very intimate mixture of alloy and carbon, is put into a revolving drum for breaking the mass into smaller pieces; and afterwards a large portion of the carbon is washed out by water. These operations are carried out in a separate building called the reclaiming house. The alloy thus reclaimed is charged again into the electric furnace with additional ore. The works now produce daily from 15 cwt. to 20 cwt. of high grade "ferro" and rich aluminum bronze product, containing from 15 to 17 per cent of aluminum. As the regular commercial grades of bronze contain respectively 1¼, 2½, 5, 7½ and 10 per cent. of aluminum, the electric furnace product above mentioned is remelted in ton quantities, and pure copper is added to reduce it to the exact desired percentage. This is cast in ingots weighing about 12 lbs. each.

An Electric Lighting Station as a Nuisance.

Below is given an interesting decision rendered on Sept. 17, in the New York Supreme Court Chambers, this city.

PHILIP BRAENDER AGAINST THE HARLEM LIGHTING COMPANY.

O'Brien, J.: The defendant sought to be enjoined is maintaining an electric lighting station adjoining plaintiff's houses on East One Hundred and Twenty-second street, and though various grievances are alleged in the complaint, upon the trial only one was insisted on, viz., that the engines and machinery of defendant placed in the rear of the main building and working at night, jar plaintiff's buildings and create noises which are unusual and ill-timed. The station was erected and the machinery in the main building was running when plaintiff purchased the property. Subsequent thereto an extension was built in which a 400-horse power engine was placed, which turns a cog wheel sixteen feet in diameter.

The extension is shown to have been constructed in a good and substantial manner, and though complaint is made that the engine is driven by a cog wheel instead of belting, there is no dispute but that the engine itself was of the very best make and was built upon piers of solid brick.

It being shown that the buildings and engines were constructed in the best manner, the business itself carried on as well and carefully as such a business can be, and the neighborhood being such as not to make the establishment of a lighting station improper, it cannot be claimed to be a nuisance per se. Not being, therefore, a public or general nuisance, plaintiff, to succeed, must show some special injury to himself.

The two grounds of special injury sought to be proved were:

First. Physical injury to the houses.

Second: Unusual disturbance and annoyance to tenants from noise and vibration caused by the engine and machinery in the extension.

These grounds, supported by evidence and showing permanent injury and continuing damage, would entitle plaintiff to an injunction.

I am, of course, familiar with decisions holding that the injury, annoyance or interference with the enjoyment of property must be substantial and real, the law not regarding trifles. The rule is well stated in Doellner v. Tynan, 38 How., 176: "That defendant is conducting his business in a convenient and proper part of the city, and in a careful and orderly manner, and it should not be interfered with merely because such business is incidentally annoying to the plaintiff, * * * or even renders the enjoyment of his property uncomfortable."

This principle thus laid down is to be considered in connection with the rule laid down in McKeon v. Lee (51 N. Y., 100; reported below in 4 Robertson).

This was an action wherein an injunction was granted against noise and vibration from an engine in a stone-cutting establishment, wherein the court says: "It may also be assumed, for the purpose of testing plaintiff's right to relief, that the defendant's business was lawful and publicly beneficial, and conducted with every reasonable precaution as to the character of his building and machinery and mode of using them. This presents the naked question, whether the lawful character of the results of an occupation, trade or mechanical art, or the care with which it is carried on, can prevent any right of action by those whose enjoyment of life and property is disturbed by the mode or means of conducting such occupation."

Applying this test to the facts in this case as to the first ground, viz., physical injury to buildings. I do not regard the evidence as proving such injury to be of a very substantial or permanent character. The buildings, themselves have not been substantially injured, and the most that can be claimed is, that for purposes of immediate sale the causes complained of might injuriously affect the price.

A removal of the cause would operate a removal of the injury.

Upon the second ground, viz., unusual disturbance and annoyance to tenant, I regard the plaintiff upon the evidence as having a substantial grievance.

While the witnesses variously characterized the character and effect of the noise and motion of the machinery, whether we assume it to be only such a noise and vibration as is caused by a fire engine or ice wagon running past the houses, as testified to by some, or as such a jarring and disturbance as to compel tenants to remove from the houses, as testified to by others, either can hardly be regarded as trifling or harmless.

Regarding only the lesser of the two, while the passage of a fire-engine or ice wagon occasionally would not interfere with the enjoyment of a house, the constant and uninterrupted rushing past of a fire engine or ice-wagon might become an intolerable nuisance.

One of the controlling considerations, however, to my mind, is the fact that before this large engine was placed in the extension, the company conducted its business in an unobjectionable way and the evils complained of did not then exist.

It would seem that for lack of space or to economize or concentrate power the company used the large engine, and ran the machinery by a sixteen-foot cog wheel instead of having smaller engines and a wheel with belting. The motion of this large engine and cog wheel concededly produced the damage. It would appear as though the injury might be avoided. The 150 horse-power engine does the city's lighting, which is one-third of the entire business, and defendant had and has three of these smaller engines working with belting and direct attachment causing no trouble. It would seemingly, therefore, be but a matter either of convenience, expense or space to obviate the cause of the injury.

I know defendant claims that the substitution of smaller machines or of belting for the cog wheel would require much more ground than they at present possess at One Hundred and Twenty-second street. To accommodate their growing business they are erecting a new and enlarged station, now nearly completed, which will contain all their machinery. Their present station will then be entirely removed.

The defendant testified to the expenditure of about $200,000 for machinery, etc. It is at present supplying under contract with the city all the electric lights for the streets in Harlem, besides merchants and tradespeople in that district, and the effect of an immediate injunction might prove ruinous to defendant, besides subjecting many persons using the lights and the city to much inconvenience. I am not unmindful, moreover, of the fact that much of the injury complained of, if suffered to be continued for a short time longer, can be compensated for in damages.

Taking into consideration the additional fact that the injury to defendant by the issuance of an injunction which would compel an immediate suspension of business would be greater than the benefit accruing to plaintiff. I am of opinion that while plaintiff should have judgment, the defendant should be allowed some time, to be fixed by the decree, to remove its plant before the judgment takes effect. Judgment accordingly.

The Court of Patent Appeals in Congress.

We give below the report made to the House of Representatives by Mr. Culberson from the Judiciary Committee of that body on the proposed bill (already printed in our columns) for establishing a court of patent appeals:

The expediency and propriety of, if not necessity for the establishment of, such a court as contemplated by this measure will not be questioned if proper consideration be given to the objects that will be attained by the passage of this bill.

Among the results reasonably expected to flow from the organization of a court of patent appeals attention may be called to the following:

(1) It would enable the public and patentees to determine the value and validity of patents without serious and vexatious delays, and thus promote the interests of all concerned.

(2) It will relieve the Supreme Court of much of the burden imposed upon it by this class of litigation.

(3) The practice in the Patent Office would become thoroughly fixed and understood and, as a consequence, the issue of worthless patents, in which unscrupulous persons deal to the injury of the public, would be greatly diminished, if not entirely suppressed.

(4) It would tend to simplifying the patent laws by constriction and settling questions of doubt which are often used by litigants for the purpose of injustice and oppression.

Without intending to present the reasons at length which induce your committee to arrive at the foregoing conclusions, the following observations are submitted:

The life of a patent, at most, is seventeen years; and if it is a valuable one, or intricate and radical, it usually requires one-fourth of that period to introduce it and secure its use by the public. This, in part, results from the fact that manufacturers who must be relied upon to make and introduce new inventions are slow and reluctant to place in general use inventions which displace or render valueless articles in the production of which they are already engaged. This is illustrated by experts, who say that to change from one style of gun to another requires from $1,000 to $2,000, and from six months to a year's time to make the model gun from which to make the dies, gauges, special tools, etc., and that to make these latter much time and money are required.

When ordinarily the financial life of a patent is abridged by the difficulties of placing the invention into general use, we can appreciate the importance of speedy decisions when it is infringed or when its validity is questioned. Under the present condition of the business of the courts it requires, ordinarily, from two to three years to obtain a decision in the circuit court of the United States, and if appealed to the Supreme Court, from three to four years are required to obtain a decision. It may be said that the same difficulty and delay attend the determination of all other questions involving the determination of property rights. While this is true, it should be borne in mind that this species or character of property differs from all other kinds of property. The duration of the owner's title is arbitrarily fixed by law. The period is short, for the most part, seventeen years.

The Constitution imposes upon Congress the duty of securing to authors and inventors, for a limited time, the exclusive right to their respective writings and inventions. It is submitted, respectfully, that this duty is very imperfectly discharged when, by the omission of Congress to provide proper means to determine questions arising out of patents, the life of a patent may be frittered away by the delays of the law.

As has been said, it requires from three to four years after a cause is filed in the Supreme Court to obtain a decision. This does not result from any fault of the judges. It is due solely to the fact that Congress has so broadened the appellate jurisdiction of the court as to overburden the physical capacity of the tribunal.

The original jurisdiction of the court, fortunately, is fixed by the constitution, and Congress cannot add to it or subtract from it, but the appellate jurisdiction of the court is subject to the power of Congress, and that authority has been exercised without proper regard to the physical capacity of the judges or the interests of litigants. This condition ought not to be continued. It operates in a great many cases as a denial of justice, and every citizen of the United States is interested in bringing about a change. It may be asked how this measure will contribute to that result? To that inquiry it may be answered that by the sixteenth section of the bill, as quoted herein, it is provided that appeals from the court proposed to be established to the Supreme Court shall be subject to the same regulations as now exist with regard to appeals to the Supreme Court in causes of admiralty and maritime jurisdiction, and to such further regulations as the Supreme Court may make.

By reference to the act of 1875, relating to the practice in the courts of the United States in cases of admiralty upon appeals to the Supreme Court and the rule of the Supreme Court upon that subject, it will be observed that the circuit court is required to make a finding of facts and law, and the review of the judgments of the circuit courts by the Supreme Court in these cases is confined to questions of law only. It follows that if a similar rule shall be applied to patent cases as the sixteenth section of the act provides, the Supreme Court in reviewing the judgments of the court proposed to be established will pass upon questions of law only, and thus from 15 to 20 per cent. of the time now consumed by the court in these cases in wading through voluminous records endeavoring to find the facts will be saved and profitably applied to the disposition of other business in the court.

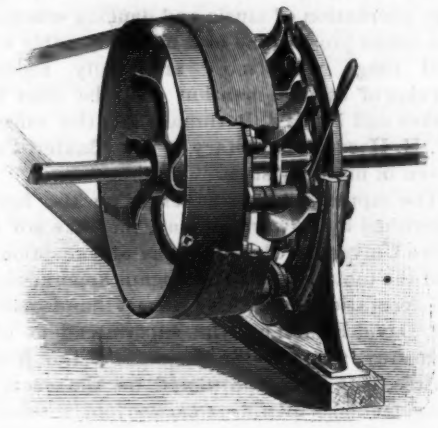
It is difficult to perceive any good reason for requiring the Supreme Court to find the facts in patent cases and not in admiralty cases. Upon the score of economy it is respectfully submitted that the expenses of this court will not exceed $30,000 per annum. Such a sum of money bears no comparison to the amount that will be saved to the people of the United States by the speedy adjudication of questions arising out of patents. To this should be added also the incalculable advantage that will result to litigants in the Supreme Court of the United States from the saving of time. The income of the Patent Office for the fiscal year ending June 30, 1888, was $1,122,994.88; expenses, $953,730.14; leaving a surplus turned into the Treasury of the United States of $169,264.49, which, added to the previously credited surplus, makes a balance in the Treasury to the credit of the patent fund of $3,337,666.65.

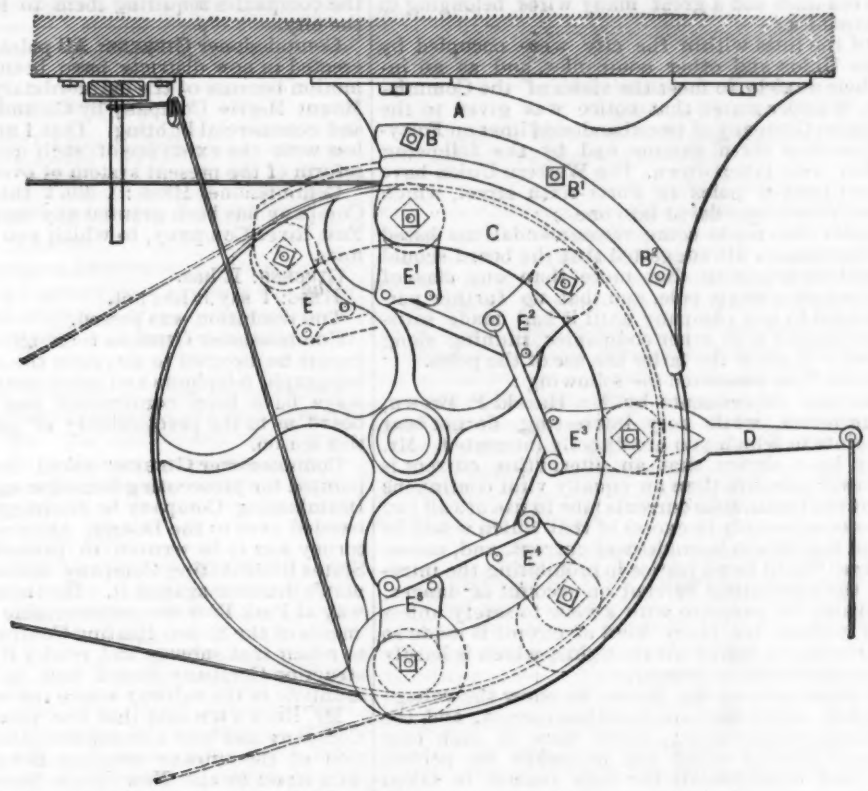
A New Cable Office.—A dispatch from Boston of September 19 says: The Direct United States Cable Company has opened an independent cable office here in the Post Office building, corner Water Street and Post Office Square. From this office there are two separate and independent direct connections with England, France and Germany, thus giving the cabling public of Boston facilities for correspondence with the outer world not enjoyed by any other city in the United States. The office is under popular management, and the public has already shown its appreciation of this enterprise by a large share of patronage.

Schenck's New Belt-Holder and Shifter for Dynamos.

We illustrate on this page an ingenious device for the perfect controlling of belts, the invention of Mr. U. H. W. Schenck, of this city. After over a year's use in connection with very heavy belts on dynamos and other fast-running machinery, it has been pronounced a decided success, having given more than the maximum results expected. This machine, being constructed entirely of iron and steel, cannot warp, and all its parts are readily duplicated. The accompanying illustrations, Figs. 1 and 2, with the following description, will give a very correct idea of its construction and method of operation.

The part associated with the pulley is of the same radius, semi-circular in form, and occupies a position to the pulley corresponding with that position in which the belt rests. *A* represents a pendent bracket secured to the ceiling or other suitable support. The lower edge of the bracket is formed in a segmental line. *B*, B^1, B^2 are bolts running through a removable segmental plate and securing it to the lower edge of the bracket. *C* is a sustaining plate formed in the shape of a sector, and is adjustable in foot *A*. Another sector-shaped plate is placed parallel





FIGS. 1 AND 2.—THE SCHENCK BELT HOLDER.

with plate *C* and at a distance from it equal to the width of belt used. Between these plates are placed webbed spiral shifters. Between webs of spirals rolls are placed, making a perfectly frictionless surface for the belt to be received upon.

The spiral shifters are moved in unison by locking devices *E*, connected with each other by links which are operated by a lever *D*, projecting from any one of the locking devices. When the lever is lowered the belt is shipped on to a holder by a common shipping rod, shown in Fig. 2. The belt when on the holder becomes an idle belt and the tension is much lessened. By raising the lever the belt is deflected to the pulley by the action of the spirals, and at the same time the tension is restored.

This operation is so effectively done that there is absolutely no shock or jar, and in electrical work no slacking up of dynamo is required, points readily seen to be of great value in electric light plants. During the past three months this machine has been greatly improved and thoroughly tested on slow speeds as well as with belts running at as high as 6,000 feet per minute. All sizes have also been made, from 12 inches × 4 inches to 72 inches × 12 inches, while still larger sizes are in process of construction, and, judging from past work, with satisfactory results assured. A working model of this device exhibited at the Electric Light Convention, just held at the Hotel Brunswick, was the object of much attention, and received many favorable comments from the representatives of prominent electric light companies.

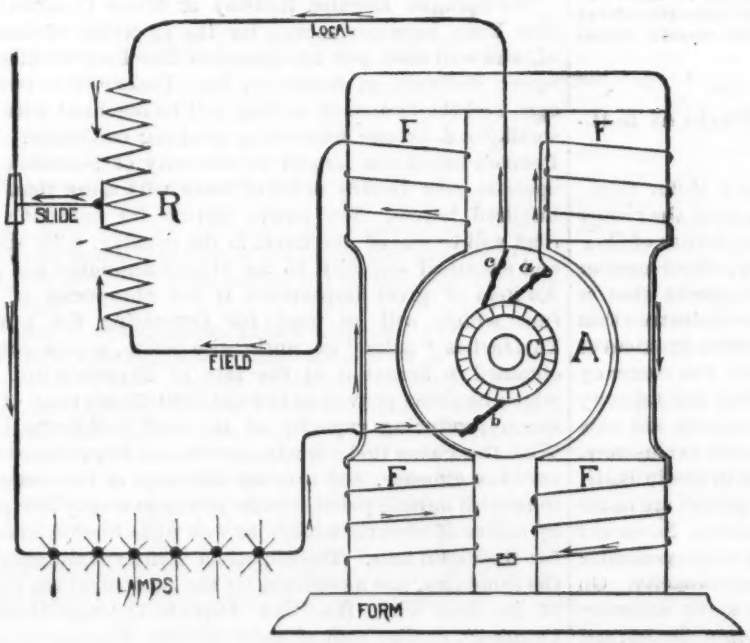
The Waterhouse Method of Dynamo Regulation.

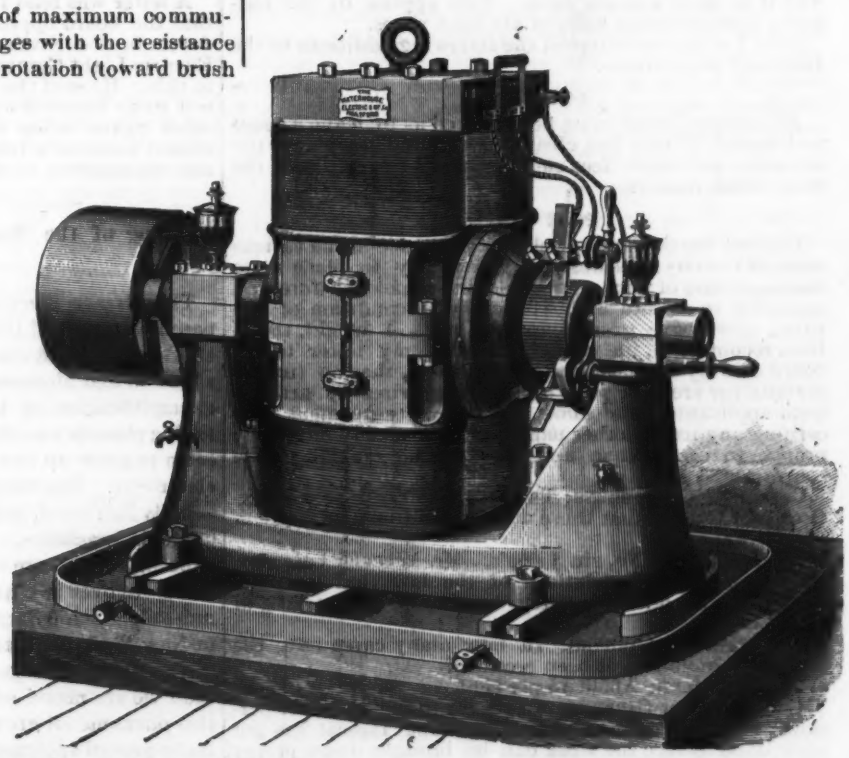
We are indebted to the Waterhouse Electric and Manufacturing Company for details as to their automatic regulator for high-tension current, illustrated herewith. Fig. 1 is a diagram of the Waterhouse type of dynamo, with a closed circuit armature *A*. Fig. 2 shows the Waterhouse dynamo, type No. 3, on which the regulator is used. On the commutator *C* are three brushes; *a* and *b* are the main circuit brushes and *c* the auxiliary brush. From the positive brush *a* the current passes on the conductor around the field magnets *F* to the resistance *R*. The current from the auxiliary brush *c* passes directly to resistance *R*, leaving the field magnets out of circuit. The currents from both circuits (field and local) join at *R*, and pass to the lamps, the current on the lamp line being the sum of the two. The amount of current in the field and local circuits is in proportion to the resistance *R* in each. The brushes have a fixed position.

There is in every dynamo a point of maximum commutation on the armature which changes with the resistance on the lamp line, moving with the rotation (toward brush *c*) when the resistance decreases, and back when it increases. This affects the current in the local and field circuits as follows: when lights are turned out the line resistance is decreased, and the maximum point moves forward and forces more current out of brush *c* and less out of brush *a*. This reduces the current in the field magnets and the E. M. F., and consequently the power required to operate the dynamo, but the current on the lamp line remains constant because the local circuit is increased proportionally to the decrease of the field circuit. The remaining lamps therefore retain their full brilliancy, while the current cannot increase and destroy the apparatus. Thus the very tendency of the machine is to perfect regulation without the aid of a mechanism; but when to this is added the simple regulator, which makes the regulation instantaneous by assisting the current to pass out at brush *c* and opposing its passage around the field magnets by way of brush *a* when lights are cut out, and forcing it out at brush *a* around the field magnets by opposing its passing out at brush *c* when lights are cut in, the efficiency of the method can be appreciated.

The regulator is illustrated diagramatically by the slide, which is controlled by a solenoid. Any tendency of the current to increase raises the contact, and the result is a decrease of resistance in the local circuit and an increase of the resistance in the field circuit. More current will therefore flow through the local circuit and less through the field circuit. The generating capacity of the dynamo is instantly reduced, and any tendency to produce a current above the standard is overcome. Should the tendency of the current be to decrease, say by a reduction of the speed of the armature, the slide lowers, increasing the resistance in th local, and reducing it in the field circuit. More current will then flow around the field magnets and less out on the local circuit. The generating capacity of the dynamo will, therefore, increase to maintain the current at standard. It should be stated that the use of resistance for balancing the field and local circuits is a small amount compared to that used by the lamps, and is not interposed, as can be seen, for the purpose of compensating for lamps turned off.

The Waterhouse regulator varies the E. M. F. directly with the resistance on the lamp line, producing self-regulation, and maintaining on that line the standard current whether one lamp or the full number are burning. By this method, as lamps are cut out, the current is reduced in the dynamo even to the fraction of an ampère, and thus one light on the Waterhouse dynamos can be maintained for any length of time without producing more than the normal and necessary current.





FIGS. 1 AND 2.—WATERHOUSE DYNAMO AND REGULATOR.

Important Meeting of the Board of Electrical Control.

At the meeting of the Board of Electrical Control on Sept. 18, Mr. Wheeler, the electrical expert, stated that 130 poles and 100 miles of wire had been removed from the various streets and avenues of the city, and that, with one exception, he had found all the companies willing and anxious to co-operate with him. The Brush Company, the Fire Department, and the Metropolitan Telephone Company especially had assisted him by every means in their power, and were still hard at work. The first task was the taking down of a few poles scattered all over the city, but later operations had included Sixth avenue, from Thirty-fourth to Fiftieth streets, where there were some old lines and a great many wires belonging to extinct companies.

Several of the lines within the city were occupied by the Western Union and other companies, and as an instance of their anxiety to meet the views of the Commissioners Mr. Wheeler stated that notice was given to the Western Union Company of two abandoned lines on Forty-first street, west of Sixth avenue, and by the following morning they were taken down. The Western Union have three distinct lines of poles in Forty-sixth street, which may presently be consolidated into one.

Mr. Wheeler here made some recommendations based on recent experience. He suggested that the board should pass a resolution requiring that more than one class of wire be strung on a single pole, and that no further permits be granted to any company until it had made satisfactory agreements with other companies running along the same route to allow the latter the use of the poles.

Mr. Wheeler then presented the following:

The paper and experiments by Mr. Harold P. Brown, before your board, while very interesting, do not bear upon the points in which you are directly interested. Mr. Brown may have shown that an alternating current is fatal at a lower pressure than an equally vital continuous current, but the continuous currents now in use are all run at pressures considerably in excess of that which would be fatal, except the Edison incandescent current, and, consequently, there would be no justice in prohibiting the introduction of the alternating current on account of danger, or even limiting its pressure with a view to safety unless the limit of voltage for every kind of circuit is made so low as to prevent the use of all arc lights, which is hardly a step to be considered at present.

As to the tests made by Mr. Brown to show the voltage required to kill, while they are doubtless correct, and the readings taken are interesting, there were in each case some elements missing which are necessary for perfect reliability, and consequently the tests cannot be taken as absolutely proving the important points. The automatic devices for cutting off the current proposed by Mr. Brown were not exhibited except incidentally.

Very respectfully,

SCHUYLER S. WHEELER,
Electrical Expert to the Board.

I would recommend the following additions to the rules of the Consolidated Telegraph and Electrical Subway Company as a guide, the standard of which may be altered, if found by experience to be unnecessarily high or dangerously low:

ELECTRIC LIGHT CABLES.

No two or more conductors, having a difference of potential exceeding 500 volts, shall be placed in the subway if made in a single cable. This applies to the outgoing and incoming sides of arc light wires.

Also, I would recommend the following additions to the rules and regulations:

LOW LAMPS.

All electric lamps must be so placed as to leave a space underneath of nine feet clear between the lamp and the sidewalk, and eight feet clear between the lamp and the floor, when indoors.

POLE LAMPS.

To meet the demands of electrical service in the various parts of the city, it is absolutely necessary to place more than one class of wire on a single line of poles, before any approach to a safe and workmanlike condition of the wires, now above ground, can be had. I would, therefore, recommend, in connection with my letter to the board of July 2, relating to rules 2 and 3, that no further permits for erecting poles or stringing wires be granted until applicants make some satisfactory agreement concerning any use by other parties of the poles which they propose to erect when necessary in the opinion of the board.

Commissioner GIBBENS: Then you don't believe with ex-Governor Cornell that these wires cannot be made reasonably safe?

Mr. WHEELER: No, sir. I don't. Mr. Wheeler here stated the number of violations of the law that had been reported, with other statistics bearing on the working of the board.

Commissioner GIBBENS: In how many cases have the matters complained of been rectified?

Mr. WHEELER: About 15 per cent.

Commissioner GIBBENS: In regard to the matter of permits, I am of opinion that something radical has got to be done before the work can be brought under proper control.

Mr WHEELER said it would be very difficult to specify the size of the poles to be used.

Commissioner GIBBENS said he had noticed in Buffalo that there the poles were 40 feet high, neat and solid looking. The cross-arms were all painted, and everything was in good shape, and he wanted to know if there was any reason why a similar arrangement should not be carried out here. Why not have all the electric light wires or one side of the street?

Mr. WHEELER said it would be rather difficult, unless 2 or 3 sizes of poles were made to accommodate all the wires; some might require to be larger than others.

Commissioner GIBBENS moved that Mr. Wheeler be authorized to bring in at the next meeting additional rules and regulations relating to electric light poles and fixtures, and that he should be prepared to place before the meeting his views as to wires and poles; the rules to specify the method in which the poles and lines shall be constructed, size of poles and all matters pertaining to electric light lines.

Commissioner GIBBENS moved that, pending this report being placed before the Board, permits in regard to poles heretofore granted to electric light companies and not acted on be revoked and the companies be notified; and also the Commissioner of Public Works be informed that there are at present no permits extant in the city of New York, and will not be until further notification is given. If the board was going to reform the condition of the electric light service in the city of New York effectually, there was no use in allowing any more of this wretched construction, and the sooner a halt was called the better. So long as the granting of privileges was continued, so long would the board fail in the accomplishment of reform.

Mr. HESS objected, and said that two such matters should not be combined in one resolution. They were separated, and the first was passed. The second was objected to by Mr. Hess because the city has contracts with the companies requiring them to light unlighted parts of the city.

Commissioner GIBBENS: All poles that were to have been erected in new districts have been placed. I make the motion because of the extraordinary latitude given to the Mount Morris Company by Commissioner Hess for public and commercial lighting. That I am opposed to. It is useless with the existence of such permits to attempt the reform of the present system of overhead wires.

Commissioner HESS: I don't think the Mount Morris Company has been granted any more privileges than the East River Company, to which you have given elastic permits.

GIBBENS: It has.

HESS: I say it has not.

The resolution was passed.

Commissioner GIBBENS then moved that the electrical expert be directed to ascertain the number of all lines of telegraph, telephone and other similar services where subways have been constructed, and make a report to the board as to the practicability of getting these lines down this season.

Commissioner GIBBENS asked that the committee appointed for prosecuting litigation against the United States Illuminating Company be discharged, and their duties be handed over to the District Attorney. The District Attorney was to be written to proceed against the United States Illuminating Company according to Justice Gorman's decision against it. He then stated that the subway at Park Row was untenantable owing to the encroachments of the Steam Heating Company. It was its duty to repair that subway and render it tenantable. The Construction Company should look to this. There was one manhole in the subway where the water actually boils.

Mr. BECKWITH said that the president of the Subway Company had sent a communication bearing on the condition of the subway crossing Broadway, Park Row and Ann street to the New York Steam Heating Company and informing them that they would be held for damages from the causes mentioned.

The New York Steam Heating Company immediately took measures to repair their leaks. Their efforts had not been as successful as was anticipated; there is still cause for complaint from the heat.

The President of the Consolidated Telegraph and Electrical Subway was notified to have the subway put into good repair. The company also received permission to extend subways across Broadway at Forty-third street and Madison avenue at Forty-first street for the Edison Company; on Madison avenue from Madison avenue and Twenty-third street to Broadway and electric light subways in 125th street from Second to Eighth avenues for the companies in the adjoining district.

A letter was read from the Callender Company asking that the board approve the conductor they wished to put down in the Sixth avenue conduit for the East River Electric Light Company. Commissioner Gibbens objected to this. He said the board ought not to be expected to test small pieces of cable, and then be obliged to test the cable again when it is put down. The manufacturers should turn out a reliable article, one which would stand the examination of the expert.

Opening of the New Baxter Motor Works at Baltimore, Md.

The Baxter Electric Manufacturing and Motor Company, who started their works two years ago at the corner of Buren and Monument streets, and the corner of Constitution and Monument streets, Baltimore, afford another exemplification of the wonderful development that is taking place in one of the newest of the new industries that seem to grow up like magic out of the modern progress of electricity. Beginning with small motors, the company rapidly increased, not only their output, but the capacity of their machines. The local Brush Company are now running three large engines on motor circuits exclusively, and have over two hundred Baxter motors in use in Baltimore alone, while large numbers of Baxter motors are in use in New York, Boston, Chicago and other cities. No sooner do the Baxter Company produce a 100,000 watt generator than we are promised another of double the capacity. On this phenomenal growth naturally follows the necessity for improved appliances and increased accommodation, and the company's new factory, which was opened on Wednesday of last week, meets all the requirements of such an expansive industry. The buildings, which are two stories high, are on the block bounded by Biddle, Chester and Chase streets and Collington avenue, and are of brick, with granite foundations. They present an imposing appearance, having a length of 300 feet and a width of 60 feet. The exterior is neat and substantial looking, and the interior is as near perfection, so far as strength of construction and excellence of arrangements are concerned, as it can be made. Contiguous to the main building, on the Collington avenue side, are the boiler room, engine room, the iron and brass foundry and the pattern shop, and each of these buildings is protected by a fireproof wall which overtops the roof.

The inaugural functions of this, one of the largest electrical factories in the world, were fittingly celebrated on Wednesday night, Sept. 19, by a brilliant entertainment given by the Baxter Company to its employés and a large number of its friends. The Reception Committee was composed of gentlemen of prominence in Baltimore and Maryland, and representatives of the Baxter Company. The second floor of the large building was beautifully decorated, and the arrangement of the flags, plants and flowers was very creditable to the tastes of Mrs. David E. Evans, who supervised it. The guests assembled at 8 o'clock, to the music of Wright's band, Mr. A. S. Bartholomaei leading the promenade. The sight of the immense room, with its artistic ornamentations, its sparkle of electric lights and its ever-changing play of color, was one not easily to be forgotten. Mr. James B. Sanner, foreman of one of the departments of the Baxter Company, made the opening address and welcomed the visitors. Mr. J. Frank Morrison, managing director of the Baxter Company, replied in a neat and effective speech, in which he outlined the history of the company, showing how, from the day of small and feeble things, it had grown up to be a corporation of wealth and influence, with a future of almost unlimited possibilities. His tribute to the energy and ingenuity of Mr. Wm. Baxter, Jr., as an inventor, was deservedly rendered and enthusiastically received. After this, the musical part of the entertainment was opened by a march composed for the occasion by Dr. G. A. Liebig, of Johns Hopkins University, which was followed by a quadrille, and this alternation of music and dancing was carried through the entire programme of a most enjoyable evening. Several songs were most artistically rendered, and deserving of special mention was the duet by Miss Sadie Baker and Mr. Hy. Bothman; and the selections by Mr. W. H. Harding, Secretary of the Baxter Company, were given in masterly style.

The supper, which was served on the lower floor, was furnished by Edward Dumay, the steward of the Baltimore University Club, and was of exceptional excellence, and the tables, with their elegant appointments and tasteful decorations, presented a very handsome appearance. Mr. David E. Evans, the superintendent of the Baxter Company, who was the chairman of the Reception Committee, is to be congratulated on the success of his arrangements, which were carried out without the slightest hitch. It was interesting to note the kindly feeling that existed between the employés and their hosts, especially as this was only an indication of the good understanding that is known to pervade their everyday business relations.

Just before supper was announced, Mayor Latrobe, of Baltimore, was introduced. He tendered his hearty congratulations to the Baxter Company on the success that had attended its enterprise and ability in the past, and his good wishes for the future prosperity of the business. After supper, dancing was resumed with renewed vigor, and the hours were very small when the strains of "Auld Lang Syne" brought the festivities to a close.

Notes on Three New Sprague Roads.

The Sprague Electric Railway & Motor Company, of New York, have contracted for the electrical equipment of, and will soon put in operation The People's Electric Street Railway, at Scranton, Pa. There will be twenty cars, and the system of wiring will be overhead with the small No. 6 bronze wire as a working conductor. The People's line is the largest in the city of Scranton and operates over twelve miles of track with more than one hundred horses. The power station for operating this road will be one of the finest in the country, with steam and electrical capacity to an almost unlimited amount. An item of great importance is the cheapness of the fuel which will be used for generating the power. This fuel is "culm," or anthracite waste, which can be obtained in Scranton at the rate of 10 cents a ton, and which has been proved to have at least 75 per cent. of the steam producing capacity of the best anthracite coal. With this cheap fuel, electric power can be produced at a very low expense, and it is the intention of the company to furnish outside parties with power at a very low price by means of electric motors, as well as to furnish enough for their own cars. The Suburban Railway Company, of the same city, has a contract for the equipment for a part of its line with the Van Depoele-Thomson-Houston Company, so that both of these systems will soon be running side by side, and street railway people will soon only need to go to Scranton to judge of both.

Since the last issue of THE ELECTRICAL WORLD, the Sprague Electric Railway and Motor Company have been awarded another and very important contract in railway work. This is with President Lowry, of the Minneapolis, Minn., Lyndale Street Railway line, and calls for the equiping of that important street railway line. The cars will run from Bridge Square to the end of the line, a distance of 14,000 feet, or over 3¼ miles. The power will be furnished by the Edison Electric Light & Power Company, whose plant is now building in the rear of the Lumber Exchange.

Before making any contract for electrical equipment the directors of this road visited a number of the differen roads in operation in this country and inspected the working of each system. That they do not look upon failure as a possibility is shown by the large amount of money which they will put into the plant. The cars to be equipped will be new and will be finer than any cars now

running in Minneapolis. They will all be lighted by electricity.

The electric cars will all be running by Jan. 1, 1889, and the Sprague people guarantee their successful operation. As stated before, the power will be furnished by the Edison Light & Power Company, of Minneapolis. Mr. Lowry has a provisional contract with this company to furnish power for the entire system. The construction of the plant is rapidly going forward, and it will be running by Dec. 15. It will be one of the most important industries in Minneapolis, and will furnish power not only for the street railway system but for a great part of the manufacturing establishments in the city, as it is more economical than steam power. The building will be eleven stories high, and fire-proof. Its construction is such that the power capacity can be increased, the idea being that the company will be able to furnish all the power used in the city if necessary. The capital stock is $500,000, and some of the wealthiest men in the city, including T. B. Walker, C. H. Chadbourne, S. G. Cook, H. C. A. Keley, and C. H. Maxcy are interested in the enterprise.

One of the seeming difficulties which beset the adoption of the motor in Minneapolis is the snow. This, however, is regarded as amounting to nothing. The Sprague Company has what it terms its "working car," which is equipped with two 15 h. p. motors and carries snow plow, ice cutter, sand and salt arrangements, etc., for making and keeping the track clear in winter.

The work of construction upon the electrical railroad at the Brookline branch of the West End Street Railway Company, of Boston, is being pushed forward as rapidly as possible, and has been nearly completed. About twenty cars will be at first fitted out with the overhead Sprague system for Brookline, and the Bentley-Knight conduit system will be used in Boston, where overhead wires and poles are forbidden. The road has been guaranteed to run without a hitch. The Sprague motors will be used on all the cars, and the only portion of the Bentley-Knight system used will be the conduit and the plows by which the current is taken therefrom. In the Bentley-Knight system in Allegheny, the conduit is in the centre of the track and the plows in the centre of the cars. In adopting the system for use in Boston, however, it is proposed to place the conduit by the side of the track and the plows outside the wheels of the car, but protected by the overhang of the curved sides. The Sprague overhead system will be the same as that for the Richmond road, except that iron posts will be used instead of wooden ones, and will be much stronger as well as more ornamental. Included in the electrical equipment will be three "working cars" for keeping the track clear from snow in winter.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
168-177 POTTER BUILDING, NEW YORK, Sept. 24, 1888.

The Gamewell Fire Alarm System.

Several places have lately been putting in fire-alarm systems, and the Gamewell Company reports itself quite busy. Some of the contracts closed quite recently were for Ishpeming, Mich., for 24 boxes and 4 large gongs; Marionette, Wis., for 15 boxes and indicator; Columbus, Ind., 12 boxes, bell striker, and a gong; Passaic, N. J., 20 boxes, bell striker, gongs and indicator. There have been several extensions of old plant, and one of them specially noteworthy is the introduction of their police call system in Washington, D. C.

Engines for Electric Lighting.

Mr. E. T. Copeland, the General Manager of the New York Safety Steam Power Company, 30 Cortlandt steeet, New York, reports an exceptional demand for horizontal and vertical high-speed automatic electric light engines. The sales last week for electric lighting alone exceeded 2,000 h. p. in horizontal engines and over 100 h. p. in vertical engines. Four of the horizontal engines, of 150 h. p. each, are to go in the new Edison station in Chicago; two of 150 h. p. for the new electric light station, Albany, Ga.; three of 160 h. p. each for the Minneapolis, Edison Electric Light and Power Company; one of 150 h. p., increase, for the Louisville Electric Light and Power Company.

The Ball Electric Light Company.

Among their late sales the Ball Electric Light Company, of New York City, report the following: 100 arc lights and 200 incandescents, through their Mexican agents, I. Aguirre & Bros., for Toluca, Mex.; 35 arc lights (increase) to the National Worsted Mills, Providence, R. I.; 70 arc lights to W. A. Walton & Co., Wood River Junction, R. I.; Hartford Electric Light Company, Hartford, Conn., 200 arc lights (increase); Jersey City Electric Light Company, Jersey City, N. J., 50 arc lights (increase); Novelty Electric Company, Philadelphia, Pa., 25 arc lights; Clarksburg Electric Light Company, Clarksburg, W. Va., 70 arc lights: Pennock Bros., Minerva, O., 25 arc lights; J. L. Bueron, Quezaltenango, C. A., 210 arc lights and 350 incandescents; Muncie Electric Light and Power Company, Muncie, Ind., 25 arc lights; The Consolidated Coal and Iron Company, Wellston, O., 26 arc lights; Ball Electric Light Company, of Cincinnati, O., 30 arc lights (increase); Manton Mills, Manton, R. I., 70 arc lights (increase).

The Mitchell-Vance Company.

For the very interesting and beautiful exhibit which the Sawyer-Man Company made at the meeting of the National Electric Light Association, the Mitchell-Vance Company, of 836-838 Broadway furnished a beautiful assortment of their newest patterns of electroliers, etc. Among the novelties which attracted much attention were the new embossed fibre shades, made in tasteful designs and tints, and of a texture like silk. These shades are made only for the incandescent lamp, and seem remarkably well adapted for that purpose. The Mitchell-Vance Company have now completed at their headquarters the new exhibition rooms on the main floor, separated from the large salesroom. Here they show all that has been done by designers and decorators in the matter of fixtures, side brackets, table lamps, etc., all of which are set off by glassware in the new tints and shapes. The work of preparing this wonderfully brilliant display has been done under the supervision of Messrs. Smith and Coggeshall, who have contrived to give a very full idea of the manner in which the electric light may be made to meet all the most exacting requirements of comfort, convenience, luxury and safety. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
178 Devonshire Street, Boston, Sept. 24, 1888.

Personal.

Mr. J. M. Betton has resigned his position as secretary of the Wainwright Manufacturing Company, and has made an engagement with Mr. Henry R. Worthington, of steam pump fame, to assume the management of the New England business, with headquarters in Boston.

Professor Elihu Thomson delivered an illustrated address on electric welding before the Franklin Institute, at Philadelphia, on Wednesday evening, Sept. 19. The professor had several welding machines in operation and gave a number of interesting experiments. The audience was one of the largest and most enthusiastic ever seen at the Institute.

More Edison Lights.

The Edison United Manufacturing Company, through its New England agents, Messrs. Paine & Francis, has closed or is at work upon the following isolated electric light installations, since Aug. 1, viz.: An increase of 375 incandescent lights at the mills of the York Manufacturing Company, Saco, Me.; 150 lights at the Hotel Vendome, Boston; 300 lights for the Holyoke Envelope Company, Holyoke, Mass.; 300 lights at the Pasadena Hotel, near Los Angeles, Cal.; 1,000 lights for the Holyoke Water Power Company, Holyoke, Mass; 450 lights at the Music Hall, Boston; 150 lights for Messrs. Gregg & Son, Nashua, N. H.; 75 lights for Messrs. Tileston & Hollingsworth, at Hyde Park, Mass.; and the firm have a number of their men at work wiring the factory of the Merrick Thread Company at Holyoke, Mass., for an increase of 800 incandescent lights.

Eco Magneto Watch Clocks.

Manager White, of the Eco Magneto Watch Clock Company, of Boston, reports the recent installation of Eco magneto clocks at the factories of the following named companies: Domestic Sewing Machine Company, Newark, N. J.; Lowell M. Palmer, Brooklyn, N. Y.; P. Reilly & Son, Newark, N. J.; Hanover Manufacturing Company, Hanover, Ill.; Halifax Mills Company, Lake Village, N. H., and the Bay State Straw Company, Middleborough, Mass.

Warner's Electric Time System.

The Standard Electric Time Company, of New Haven, has closed contracts recently for installations of the Warner electric time system at New Britain and Danbury, Conn. The company is making extensive arrangements to give an exhibit of electric clocks at the coming State Fair, to be held at Danbury the first week in October. Each department in the Fair building will be furnished with an electric clock. Private plants of clocks have just been placed in the factories of the Scoville Manufacturing Company and the Mathews & Millard Company, in Waterbury. The success of the "Warner system" is apparent from the fact that it has continually grown from the start, some five years ago in Ansonia, Conn. The company have now eight plants of the general system in successful operation in the State of Connecticut, and a large plant in Kansas City, Mo., besides nine private or isolated plants in manufactories. The action of this system is automatic, and requires little or no care. The company also report a large demand for the Warner electric gauges.

Feed Water Heaters in Demand.

The Wainwright Manufacturing Company, of Boston, reports that the sales of the Wainwright Heater during the past six weeks exceed those of any six months of previous years. The electric light people who are using this make of feed water heater speak of it in complimentary terms.

Thomson-Houston Electric Roads.

The West End Street Railway Company, of Boston, Mass., has been for some time past investigating with great care the different methods of street car propulsion, including the cable and various electrical systems, with a view of introducing upon their lines in Boston and vicinity the most approved and economical method. In the course of their investigations they have made it a point to visit the different cities throughout the United States where the various systems are in operation. During the past summer the attention of the West End Company was drawn, in the course of their investigation, to the Thomson-Houston street railway system as employed by the Lynn & Boston road on its very successful beach road at Revere, and at other points where this system is in use. As the result of their investigations and negotiations with the Thomson-Houston Company, Mr. Whitney, president of the West End road, in behalf of the West End Company, on Sept. 14 closed a contract with the Thomson-Houston Electric Company, of Boston, for the equipment of a portion of the West End road with their electric motors. The Thomson-Houston Company will begin at once the construction of a line from Harvard Square, Cambridge, to Arlington, to be operated by the overhead system. Cars are to be in operation within 60 days, and as soon after the completion of this section as possible work will be begun on a line to enter Boston to Bowdoin Square.

The Thomson-Houston Company has at present 19 roads in successful operation at the following places: Scranton, Pa., 3; Revere, Mass., 2; Syracuse, N. Y.; Washington, D. C.; Ansonia, Ct.; Binghamton, N. Y.; Detroit, Mich.; Jamaica, N. Y.; Port Huron, Mich.; St. Catherines, Ont.; Wheeling, West Va.; Appleton, Wis.; Dayton, O.; Fort Gratiot, Mich.; Lima, O.; and Windsor, Ont. The company have also in process of construction roads at North Adams, Mass.; Wichita, Kan.; Des Moines, Iowa; Omaha, Neb.; Lynn, Mass.; Danville, Va., Hudson, N. Y.; Seattle, Wash. Ter.; and Bangor, Me., and orders in hand for others.

The "Simplex" Tree Insulator.

The improved Simplex tree insulator is being received with great favor. The name of this device is somewhat misleading, as the object, well met, too, is not to insulate the wire, but to protect an insulated wire from coming in contact with branches of trees. W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
39 South Tenth Street, Philadelphia, Pa., Sept. 22, 1888.

The Novelty Electric Company,

who are now thoroughly established in their fine new building at Nos. 48 to 52 North Fourth street, are about to erect for their own use a 25-arc light plant, using a Ball dynamo. The machine will be of the divided arc pattern, 25 volts and 4 ampères, requiring but 8 h. p. for the plant. They also contemplate the erection of a large incandescent plant, from which the stores and buildings in the square in which the Novelty works are located will be supplied with light and power. The Novelty people are agents for the Ball dynamo, and also for the Guion Automatic Heat Regulating Company and the Okonite Company, for all of which they are doing a splendid business. A new and complete catalogue will shortly be issued, some delay having been caused in its preparation by the pressure of other business upon Mr. Trump and his assistants.

The Leber Regulating Incandescent Light.

The workings of the Leber regulating incandescent light were shown last Tuesday night in the *Ledger* job office to a number of gentlemen interested in electric lighting. The invention is one by which the brilliancy of the light may be increased or decreased by the turning of a key, the same as an ordinary gaslight attachment. The light shown was regulated to show any degree of brilliancy from one-sixteenth of a candle-power to one hundred candle-power, making it available for householders. The exhibition was a highly successful one, and the new light will betaken in hand by a number of Philadelphia capitalists.

Power to Lay Conduits.

The authority of the Keystone Light and Power Company to dig up the streets to lay its conduits was argued last week before Judges Allison and Biddle, in equity proceedings to restrain the city from preventing such work. The city solicitor denied that the company has the power to enter upon a city street without first obtaining permission of councils. The company claimed that its charter gave it such right. The court held the matter under advisement.

Scranton's New Electric Road.

A special dispatch from Scranton, Pa., says: "The third electric street railway in this city was put into operation Wednesday morning last. The start was made successfully, and as it reaches a portion of the city (South Scranton) not heretofore traversed by street railways, its managers expect it to be largely patronized. State Senator Watres is at the head of the enterprise. The People's Street Railway is also substituting electricity for horses on its four lines to Dunmore, Green Ridge, Providence and Hyde Park, and expects to run cars by Nov. 1.

Franklin Institute Meeting.

At the Franklin Institute last Wednesday evening Mr. Henry Pemberton, Jr., read a very interesting and intelligent paper on "Aluminium," the most abundant of the elements which make up the crust of the earth. The document treated fully of the relative value of the alloys of this metal, of the important part it is destined to play in the arts and manufacture of philosophical instruments, and of its merits as a composition for heavy ordnance, owing to its enormous tensile strength. Mr. W. E. Gump, of New York, read a paper on "The Writing Telegraph." Common writing paper and ink were used in the experiment. By special request Prof. Elihu Thomson, the well known electrician of Lynn, Mass., exhibited the practical operation of his method of electric welding, which was loudly applauded.

Sea Isle City, N. J.

Mayor Ludlam, of Sea Isle City, N. J., has been held for trial at court on the charge of aiding a forcible entry of the electric light building, which was closed under an attachment, and which is still in litigation.

Subway Privileges.

At the meeting of the Electrical Committee of City Councils Thursday, an ordinance was read and favorably considered authorizing the American Telegraph and Telephone Company to lay conduits for its telegraph and telephone wires on the west side of Fifty-second street to Lancaster avenue. An ordinance was read and ordered to be reported favorably authorizing the Bell Telephone Company to extend its conduits on Third street from Vine to Callowhill, thence on Callowhill street to St. John street, St. John street to centre of square between Callowhill and Noble streets, on South street from Second to Front, and on Walnut street from Water street to Delaware River. The Bell Company was also given permission to "construct manholes and lay and maintain conduits, cables and wires and erect poles for electrical purposes on Lombard street east of Second and along Second to Exchange place."

Brush Apparatus.

E. W. Tisdall, general agent of the Brush Electric Company, of Philadelphia and vicinity, has recently sold to Geo. V. Cresson, of this city, an incandescent and an arc light plant. The incandescent plant consists of a 200-light Brush dynamo with full complement of lamps in position. The arc light plant consists of one Brush 45-light arc dynamo with 40 lamps in position. The construction work is being done by the wiring contractor, L. Porsh, who does nearly all of Mr. Tisdall's work. E. W. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
44 Lakeside Building, Chicago, Sept. 22, 1888.

Brush Plants in the West.

Mr. Alexander Kempt, the Chicago agent of the Brush Electric Company, has just sold two incandescent plants; one went to the Mishawaka Woolen Manufacturing Company, of Mishawaka, Ind., consisting of a 150 light incandescent dynamo with a full complement of lamps; and the other is a duplicate plant to Studebaker Brothers Manufacturing Company, of South Bend, Ind. The Studebaker Brothers Manufacturing Company have a very complete Brush arc and incandescent plant. Some of their dynamos have been in operation for seven or eight years, and are to-day working as well as at the start. Mr. Kempt has also recently sold a small arc light plant for the steamer "Pauline," Hannibal, Mo.

Moving for Lower Telephone Rates.

At a meeting of the License Committee of the City Council, held in the Corporation Council's office on the 13th inst., the committee directed the counsel to prepare an ordinance for the regulation of the Chicago Telephone Company, such a one as would protect the city's interests and which would fix the annual rental at $75 per telephone in accordance with a petition signed by three thousand renters which had been presented to the committee. The committee discussed the right of the council to fix the rental, and the Corporation Counsel declined to express a decided opinion.

The Northwestern Fire Underwriters' Convention.

The 19th annual convention of the Northwestern Fire Underwriters was held at the Grand Pacific Wednesday and Thursday of this week. The convention was largely attended and several valuable papers were read.

Equipment for the Hotel Richelieu.

The Electrical Construction Company has just put in the Hotel Richelieu, of this city, a new Hess annunciator, with return call and fire alarm.

The Mayo Incandescent System.

Mr. Geo. A. Mayo, as I mentioned in my notes last week, has taken the position of general manager and electrician of the Van Depoele Company. Mr. C. J. Van Depoele retains the position with the company of consulting electrician. The company will commence at once the manufacture of the Mayo system of incandescent lighting, and are at present making estimates for putting in different plants. The offices of the company are being fitted up with incandescent lights, which will soon be in operation. The dynamo has been improved, the construction and appearance being rather different from the type illustrated in THE ELECTRICAL WORLD some time ago.

More "L" Road Agitation.

The Council Committee on Streets and Alleys of the West Side met on Monday last to discuss an elevated railway ordinance. The meeting was packed with interested people. Promoters of different systems were on hand with models and drawings, which were inspected by all who desired. Alderman Badenoch announced that the petition of the West Side Elevated road had been referred to the Commissioner of Public Works for the identification of the signatures, and until that was done no action would be taken by the committee. Mr. Millard Woodward, of the Citizens' Committee and the West Chicago Rapid Transit Company, presented an address to the committee. The tone of the address was, of course, in favor of some method of rapid transit. He clearly showed that the street horse car facilities were not sufficient to accommodate the people and that there was great need of some method of rapid transit.

Personal.

Mr. W. H. McKinlock, of the Central Electric Company, has just returned from a three weeks' trip in search of pleasure, health and recuperation to Mackinaw, Petoskey, Detroit and Ann Arbor, Mich.

In a Fargo Hotel.

The Central Electric Company has just completed for Mr. Geo. Hancock, architect of the Dakota Improvement Company's new hotel at Fargo, Dak., a one hundred room annunciator, guest-call and fire alarm. The hotel will be the finest in the city.

Increasing Their Plants.

The Chicago City Railway Company are increasing their electric light plant, corner of Twentieth and State streets, by the addition of Excelsior lights, as also are the Union Stock Yards and Transit Company, of this city.

Greeley, Colo.

The Greeley Electric Light Company are replacing their arc light plant with 800 incandescent lights of the Thomson-Houston system.

Nevada, Mo.

The Nevada Gas and Electric Light Company are increasing their plant with 50 Thomson-Houston arc lights.

Cadillac, Mich.

W. Cummer of this city has purchased 500 incandescent lights, Thomson-Houston system.

Mancelona, Mich.

The Oval Wood Dish Company are lighting up their plant with 24 Thomson-Houston arc lights.

Isolated Thomson-Houston Plants.

Armour & Co. have ordered 75 arc lights of the Thomson-Houston system for lighting up their plant at the stock yards. Among other recent installations the company report the sale of a small arc plant to the Tamarack-Osceola Copper Manufacturing Company, of Portage Lake, Mich.

Lighting in St. Louis.

The large and magnificent eight-story wholesale dry goods house of Ely & Walker is to be lighted by electricity. The Excelsior system will be used, the contract having been awarded the Western department of that company after what Manager Horne terms sharp competition. This is said to be the largest wholesale dry goods house in St. Louis, and the equipment of it with Excelsior lights will certainly reflect credit.

The Metropolitan Electric Light Company, of this city, have recently started up their 60-arc light plant of the Excelsior system. The company have also just put in operation a 10 h. p. motor of the new Hochhausen type, to be used for running a printing office. Robert Brookings, general manager of the Samuel Cupples Wood Ware Company, have also ordered a 7-arc plant of the Excelsior system for lighting one of the company's saw mills in Michigan.

Telephone Quotations.

Col. S. G. Lynch, broker, 146 La Salle street, furnishes quotations upon telephone stock as follows:

Bell of Mo.	$150	@$155	Iowa Union	$28	@ $29
Central Union	47	@ 48	Michigan	81	@ 82
Chicago	340	@ 345	Missouri and Kansas	70	@ 71
Colorado	43	@ 46	Rocky Mountain Bell	41	@ 43
Cumberland	65	@ 68	Wisconsin	110	@ 112
Great Southern	34	@ 37		E. L. P.	

ENGLISH NOTES.

LONDON, Sept. 12, 1888.

Eastbourne and the Electric Light.

The by no means ample list of English towns in which electricity has received municipal countenance will now be still further attenuated by the omission of Eastbourne. As I informed you in a previous letter, the Eastbourne Electric Light Company, whose contract for lighting the sea front shortly expires, have notified that they cannot continue the lighting at the expiration of the contract unless they are paid £35 per arc lamp per annum in lieu of £25 as at present. The General Purposes Committee of the Town Council, anxious to keep the light, suggested £30 per annum, but the company said £35 per lamp gave "but a narrow margin of profit," and refused the offer. Under these circumstances, the committee, unable to stomach the sudden jump from £25 to £35, were obliged to propose the discontinuance of the electric light. The Town Council has now approved of this proposal, and before long Eastbourne parade will once more be in darkness after sunset. If £35 only leaves a narrow margin of profit now, when everything connected with electric lighting is so much cheaper, even this sum would not have been remunerative when the contract was entered into, and yet £25 was the price then asked. Comment upon the business-like nature of such a contract is superfluous. I am afraid the Eastbourne Electric Light Company is not the only one in this country which is led away by the desire to compete in price with gas, and is consequently driven to enter into absurdly unremunerative contracts, in the Micawber-like hope that something will turn up in the way of private lighting which may save them from ultimate loss.

The Manchester Multiple Switch-Board.

After the recent annual meeting of the Lancashire and Cheshire Telephonic Exchange Company, at Manchester, a number of shareholders and others inspected the new multiple switch-board at the Royal Exchange. The Lancashire and Cheshire is one of our most pushing and prosperous provincial telephone companies, and the switch room arrangements at its new central office are in keeping with the rest of this company's system. The new board is capable of accommodating over 4,000 subscribers, and several important improvements have been introduced by Mr. J. Poole, the company's electrician. Upward of 100 miles of wire is used in joining up the various sections, and some 65,000 soldered connections have been made.

Collisions at Sea.

The recent collision between the "Thingvalla" and "Geiser" has given rise to a prolonged and abstruse nautical controversy in the *Times* as to merits and demerits of our present rules of the road at sea. Capt. P. H. Colomb started the ball, Admiral de Horsey replied, and we seem as far off finality to-day as we were three weeks ago. Several suggestions of interest to electricians have come to light. A Mr. J. Kenward recommends the use of incandescent lamps of high candle-power for the port and starboard lights. The power of these lights, he thinks, could be proportioned, as no oil lamps can be, to the penetrating power of the white light overhead, and if all the three triangular lights were of equally long range, the dangers of collision would be greatly reduced. More striking, but perhaps less practicable, is the suggestion of Mr. J. H. A. Macdonald, of North Berwick. He proposes that an electric light, with holophote reflectors, should be placed on the bridge under the control of the officer in command. The handle by which this light can be moved is to be regulated absolutely by the position of the helm. When the helm is moved a detent is released and the ray of light sweeps over the water, giving the same signal to a passing vessel as the driver of a vehicle gives with his hand. When the light has completed its sweep it is to be automatically shut out. Whether either of these ideas is really worth much I leave to nautical men to decide, but it is evident by the daily shoal of letters to the *Times* that something is wrong, and I do not see why electricity should be found wanting in this connection more than in any other. The electric light ought to be without a competitor on board ship, and when once there I can see nothing but prejudice and habit to prevent it being used aloft.

THE TELEGRAPH.

Saginaw, Mich., is to have a fire-alarm system.

Cincinnati, O.—Mr. F. Riehl, superintendent of the fire-alarm service, has asked for a renovation of the system, at a cost of about $15,000.

Multiplex Telegraphy.—The American Multiplex Telegraph Company, of this city, has been incorporated by F. J. Patten and others, with a capital stock of $10,000.

THE TELEPHONE.

Durham, N. C.—Mr. G. H. Glass proposes to establish a telephone exchange.

New Telephone Stocks.—All the treasury stock offered for sale of the National Telephone Manufacturing Company has been taken up, the Boston *Herald* says. The Knickerbocker Telephone Company, organized under the laws of New York, has purchased a license for that State from the National company. Capital stock, $125,000; 12,500 shares at par, $10.

Stockholm, Sweden.—As one of the most interesting things at his capital, the King of Sweden took his guest, the Emperor of Germany to see the fine large telephone exchange, which has a Western Electric equipment.

Drum Telephony in Africa.—It is reported that the natives of the Cameroon district, on the west coast of Africa, telephone or telegraph to each other by drum playing. The system of signals is not common property, but is known to only about 200 natives, who serve on occasion as operators.

Southern New England.—The Southern New England Telephone Company is arranging to have all its subscribers call up by number instead of by name, according to the practice which now prevails elsewhere. The new directory of the company shows that it has subscribers in 274 cities, towns, villages and hamlets in its territory, which comprises Connecticut and small portions of Massachusetts and New York.

THE ELECTRIC LIGHT.

Brookings, Dak., is to be lit by a Waterhouse plant.

Carlisle, Ky.—Mr. M. King, of St. Louis, is arranging for the erection of an Edison plant.

High Point, N. C.—Mr. E. D. Steele is seeking to interest capital for an electric light plant at High Point.

San Diego, Cal., is to have its Westinghouse plant of 1,300 lights running, it is said, by the beginning of October.

Statesville, N. C.—Messrs. D. A. Miller and U. B. Mills are the city committee investigating electric light systems.

Weatherford, Tex.—The Weatherford Water, Ice and Light Company is to put in an electric light plant at once.

Meridian, Miss.—A proposition from the Waterhouse Company for a plant of 75 arcs is being favorably entertained.

Greeneville, Tenn.—The Greeneville Electric Light Company has been incorporated to put in a plant for general lighting.

Sherbrooke, Can.—The Sherbrooke Gas and Water Company is to light the city with a Ball plant of 70 arc light capacity.

Mobile, Ala.—The Bay Minette Cotton Manufacturing Company is to put electric light plant in a new mill near Mobile.

Xenia, O.—The Xenia Electric Light Company has been incorporated by H. C. Hardy and others with a capital stock of $10,000.

Jackson, Miss.—The Indianapolis Jenney Company have contracted to put in the plant for the city, and have it in operation in 90 days.

Lexington, Va.—The Richmond Electric Light and Power Company is to erect a plant at Lexington if it obtains the necessary permit.

Columbia, Tenn.—The Columbia Electric Light and Power Company, of which Mr. E. C. McDowell is president, is to put in a plant shortly.

Homestead, Pa.—The Homestead Electric Light and Power Company has been formed by L. Roit and others with a capital stock of $10,000.

Cleburne, Tex.—The Cleburne Electric Light Company has been incorporated by E. M. Heath and others with a capital stock of $25,000.

Greenville, Tex.—The new water-works company, of which Mr. J. M. Cook, of Greenville, is president, is to put in an arc plant of 35 lights.

Norwich, N. Y.—The Norwich Light and Power Company has been incorporated with a capital stock of $25,000, by D. Farlin and others.

Holyoke, Mass.—The Holyoke Water Power Company proposes to go into the incandescent lighting business, and on a large scale, it is said.

Easton, Pa.—The Edison Illuminating Company, of Easton, has been incorporated by H. G. Lombler and others with a capital stock of $50,000.

Louisville, Ky.—The plant of the United States Company at Louisville was damaged $10,000 by a fire recently, but has been put in good shape again.

Fall River, Mass.—It is said to be likely the Heisler system of electric street lighting will be adopted by the Citizens' Electric Light Company, of Fall River.

Charleston, S. C.—The Charleston Electric Light and Power Company have made arrangements for enlarging their plant, and will go into the motor business.

Sawyer-Man Lamps, it is stated, have been substituted on other systems to the number of over 30,000, and there have been more than 10,000 displacements by it since Sept. 1.

El Paso.—The El Paso Light Company, incorporated by J. J. Gurdson and others, has a capital stock of $50,000. It is reported that the El Paso Gas Company is putting in a plant.

New Orleans, La.—Mr. W. Oswald, agent for the Edison United Manufacturing Company, has just installed 100 lights for the Weckerling Brewery, 125 lights for the Pelican Brewery, 100 lights for the Monroe Oil Mills and 50 incandescents and 4 arcs for the steamboat "Governor J. C. Brown."

Marysville, Kan.—Messrs. Swan & Parrish, of Marysville, have put in a fine central station Brush plant of 20 arcs and 200 incandescents. There are two dynamos, driven by "Ideal" engines and boilers furnished by English, Morse & Co., of Kansas City. The city takes eight arcs, and nearly the whole capacity of the plant has already been taken up. The installation was made by Mr. N. J. Doty, and is reported the best in Northern Kansas. The citizens are universally pleased with the new light.

The Brooklyn Bridge Lights.—Acting Attorney-General Maury has instructed United States District Attorney Walker of New York to take the necessary legal steps to compel the Trustees of the New York and Brooklyn bridge to comply with the law relative to the lighting of bridges over navigable rivers. It is stated at the Light House Board that the bridge company will be required to expose the usual red and green signal lights, and to

do away with all false lights which interfere in any way with the regulation lights considered necessary to the safe navigation of the river. The electric lights now on the bridge will, it is said, interfere with these lights, and will have to be removed unless they are arranged by shading or otherwise so that their rays shall not so interfere.

Providence, R. I.—The Narragansett Electric Lighting Company has begun the construction of a new station at the foot of Elm street on the river front, Providence, where a lot of land 200 by 300 feet has been bought with a wharf frontage of 200 feet. The contracts are not all concluded yet, but the foundations are in for the dynamo room, 60 by 200 feet, a single story structure to be built of brick with brown stone trimmings and an iron roof. The pile foundations are also down for the stack, which will be a 14-foot flue, octagon in section and 200 feet high. The boiler room will be in a separate building across a driveway, and coal pockets will be built over the boiler house into which coal may be delivered from vessels with but a single handling. The premises are arranged so as to allow of duplication of both the power and dynamo houses, if necessary, and the lot will afford opportunity for the establishment of one of the largest stations in the country if needed.

APPLICATIONS OF POWER.

The Love Electric Railway Company has been incorporated at Camden, N. J., with a capital stock of $500,000, by T. W. Thompson and others.

Adrian, Mich.—The Adrian City Electric Belt Railway Company has been incorporated by M. E. Chittenden and others with a capital stock of $50,000.

The Electric Car Company of America has recently issued a neat little pamphlet on its patents for storage cars. The list enumerates several patents of Anthony Reckenzaun, R. M. Hunter and G. H. Condict. The company is the sole and exclusive licensee of the Electrical Accumulator Company for storage cars applied to traction, except in California, Nevada, Oregon, Washington, Idaho and Arizona.

Worcester, Mass.—The Worcester Electric Power Company have put a new 10 horse-power Daft motor into the Wachusett mills at Wachusett. This is the second motor of the same size and pattern that this company have put into the mills. The orders for power are fast accumulating and a number of customers at the foot of Main street will be supplied as soon as the wires can be put in place. A small motor of from ⅛ to ¼ horse-power has been introduced by this company for light work.

PERSONALS.

Mr. Allan V. Garratt has been tendered the position of secretary and treasurer of the National Electric Light Association.

Mr. W. A. Giles has joined the forces of the Sawyer-Man Electric Company, and will devote his energies to the lamp end of the incandescent business.

Mr. G. W. Mansfield, the street railway expert of the Thomson-Houston Company, has been busily engaged in getting the plant and line at Washington in readiness. The iron poles have been set in the centre of the road, and at regular intervals carry groups of arc lights. The road will be ready next month.

Mr. R. M. Jones, of Laramie, Wyo., has in course of construction a central Edison station having over 1,000 lamps capacity, at Evanston, Wyo. He is personally conducting the construction, which will be completed about Nov. 1, using the Edison system, "3-wire," complete. The engines are by A. L. Ide & Son, of Springfield, Ill.

MISCELLANEOUS NOTES.

Possible Phonographs.—With regard to his recent article Mr. Oberlin Smith writes: "In my article upon 'Possible Phonographs' in your issue of Sept. 8, in the second paragraph, fourteenth line, the word 'short' should read 'soft.' In the cuts, Figs. 4 and 5, the helix should be shown very short, and possibly might consist of only one coil, as with the long helix represented it would be impossible to localize the magnetism in the way desired. These cuts, of course, are conventional, and are merely intended to show the principle involved. At the time I experimented I also tried drawing the cord across the corner of an electro-magnet around which the helix was wound, instead of allowing it to act directly upon the cord. This would probably be a better way, providing there was not too much magnetic inertia to prevent rapid action. This I feared at the time, but on further reflection it seemed as if such a magnet ought to work as quickly as the magnet of the telephone itself."

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal Street, N. Y., carry a complete stock of iron and brass machine and wood screws, bolt, cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

The Partz Electric Battery Company, of Philadelphia, having found their old quarters at 1,723 Chestnut street too small, have leased the large building at 636 Arch street, same city. They are now prepared to fill all orders promptly, and in addition to their large line of Open Circuit and Gravity and Motor Batteries, have a full line of small Motors and Dynamos. Send for their price list and catalogue, or write to them stating what you want.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED SEPT. 4, 1888.

388,836. Electric Bell; Moses G. Crane, Newton, Mass. Application filed April 9, 1888. By this invention the bell hammer is actuated by the strong current of a powerful battery which is normally in open circuit, but is controlled by the weaker current in the normally closed circuit, which is sufficient to hold the armature when near the poles of the magnet.

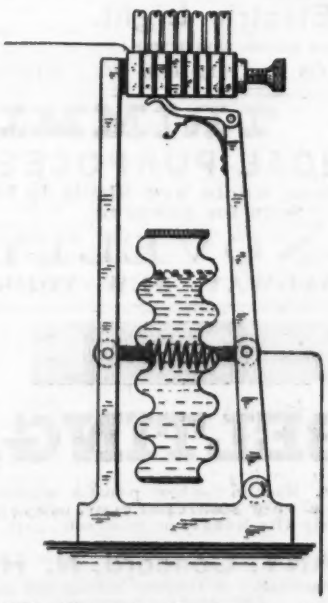
388,837. Electrical Annunciator; Charles H. Crockett and Chancellor C. Allen, Boston, Mass. Application filed Sept. 6, 1887. The object of the invention is to provide a simple, cheap and effective annunciator, that shall occupy but small space and be positive and sure in its operation.

388,859. Electrical Cash and Parcel Carrier; Geo. F. Green, Kalamazoo, Mich., Assignor of two-thirds to Oliver S. Kelley, of Springfield, Ohio. Application filed Oct. 1, 1887. A motor is arranged upon the carrier for driving the same.

388,862. Submarine Torpedo Boat; Horace P. Griswold, Providence, R. I. Application filed Aug. 27, 1886. A compass is mounted upon the torpedo and is revolved intermittently by suitable mechanism. The motions of the compass needle are transmitted to an electrical device which controls the rudder. By this invention a torpedo may be sent upon a predetermined course and return to starting point.

389,869. Electric Signal; Henry T. Hill, Manchester, N. H. Application filed Dec. 17, 1886. An electrical signaling apparatus consisting of an electrical circuit, including electric bells connected by a triple wire cable whose wires are attached to circuit closing switches, two of the wires being permanently connected with the batteries and bells, said circuit being normally open, but adapted to be closed to ring the bells by a pull upon the cable, which oscillates the switches and brings the third wire into circuit.

(1) 388,876. (2) 388,877. (3) 389,080. (1) Magnetic Annunciator; (2) Magneto-Electric Machine; (3) Electro-Magnetic Bell; Wm. Humans, Cambridge, Mass., Assignor to the American Magnetic Electric Company of Jersey City, N. J. Application filed July 23, 1885. (1) An annunciator having a series of permanent magnets arranged with like pole to the like poles of the neighboring magnets, the magnets being substantially uniform in size and shape, and each magnet having its armature arranged within and supported by it. (2) A magneto machine whose body is formed of magnets arranged together, closed at the ends by covers and with the armature and pole-pieces within the case so formed. (3) A bell consisting of a permanent magnet, an armature with its pole surfaces cylindrical, its shaft coincident with the geometrical axis of the cylindrical surfaces of the armature and its coil between its poles.



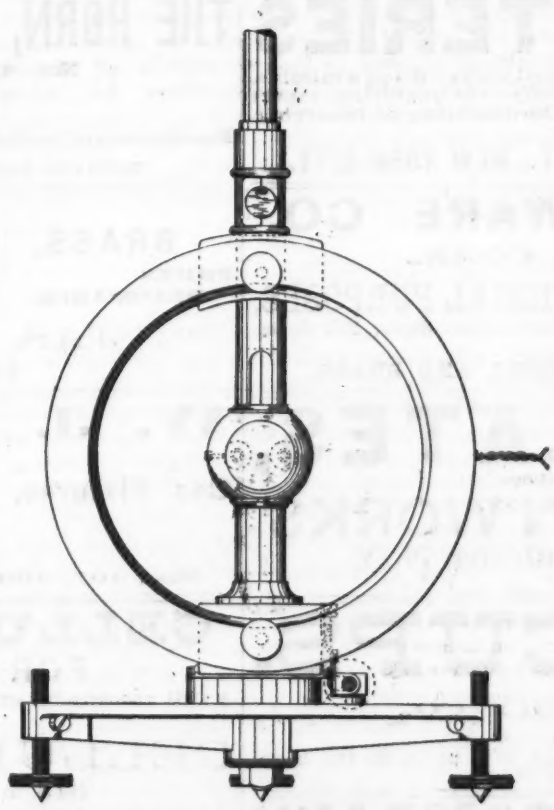
389,265. THERMAL RESISTANCE DEVICE.

388,922. Telegraph Exchange System; Robert J. Sheehy, New York, N. Y. Application filed Dec. 9, 1887. A central controlling device consisting of a source of intermittent electric impulses, is connected through all the several instruments of the system. Conductors lead from the recording devices of each instrument of the system to the central station.

388,955. Electrical Railway Conductor; Leo Daft, Plainfield, N. J. Application filed Oct. 16, 1885. A construction designed to better support and insulate the current conductor.

389,001. Switch Mechanism for Electric Batteries; Charles E. Ongley, New York, N. Y. Application filed Nov. 21, 1887. Where a plurality of batteries are to be used successively, in connection with a motor, for operating a vehicle such as an elevator, this switching device is geared to the vehicle in such a manner that at regular intervals the battery in use will be cut out and a new one switched in.

389,011. Dynamo-Electric Machine; Andrew L. Riker, New York, N. Y. Application filed Jan. 19, 1888. The invention relates to the form of the field magnets and frame. The field magnets have a connecting yoke of magnetic material cast on the ends of soft iron cores.



389,274. STANDARD TANGENT GALVANOMETER.

389,062. Telegraphy; P. B. Delany, New York, N. Y. Application filed May 26, 1888. In order to free the line from static disturbances or extra currents it is automatically grounded at one or more points or way stations each time that the battery is taken from the line.

389,097. Cock or Faucet; Edwin A. Newman, of Washington, D. C., Assignor to the Newman Anti-Freezing Water Pipe Company, of Chicago, Ill. Application filed Nov. 5, 1887. There is combined with the faucet an electric switch which is turned simultaneously with the turning of the faucet, to operate at a distance other valves or faucets.

389,122. Device for Actuating Street or Station Indicators; Wm. A. Turner, San Francisco, Cal. Application filed Jan. 31, 1888. Two circuit closing levers are connected with the vehicle. It requires the operation of both simultaneously to manipulate the indicator. By this arrangement the indicator cannot be operated by the accidental movement of one of the levers.

(1) 389,124, (2) 389,125. Apparatus and Art of Utilizing Solar Radiant Energy; Edward Weston, Newark, N. J. Application filed Oct. 17, 1887. For discription see THE ELECTRICAL WORLD, Sept. 22.

389,140. Galvanic Battery; Asahel K. Eaton, Brooklyn, N. Y., Assignor of one-third to Colin M. Thompson, of same place. Application filed Oct. 7, 1887. In order to prevent disintegration of the porous cup, caustic lime is added to the solution.

389,142. Printing Telegraph; Bradley A. Fiske, of the United States Navy, Assignor to the Western Union Telegraph Company, of New York, N. Y. Application filed Aug. 13, 1888. Claim 1 indicates the structure. In a printing telegraph, the combination of a shaft, a type-wheel mounted loosely upon said shaft, independent motors respectively tending to rotate the type-wheel and shaft continuously in the same direction, an escapement for controlling the step-by-step rotation of the shaft, and a second escapement for the type-wheel, the releasing mechanism of which is affixed to and rotated by said shaft.

389,151. Electrical Gas Lighter and Extinguisher; George L. Hogan, Olmstead, Ky. Application filed Feb. 18, 1888. The gas is turned on and off from the effect of the heating action of the current. The gas is ignited by an incandescent wire.

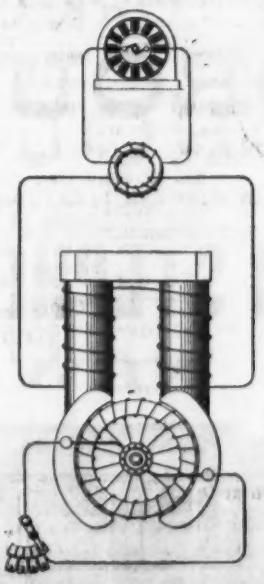
389,184. Commutator for Electric Generators; Otto Zech, Detroit, Mich., Assignor of one-half to Gustave A. Winemann, of same place. Application filed Sept. 6, 1887. A single cylinder of insulating material is provided with collars formed integrally therewith. A series of metal rods having feathers or keys are secured in a corresponding series of longitudinal perforations formed in the cylinder and collars.

PATENTS ISSUED SEPTEMBER 11, 1888.

389,186. Secondary Battery; C. B. Askew and J. K. Pumpelly, Chicago, Ill. Application filed July 18, 1888. To prevent the falling out of the plugs in the plates of a secondary battery, the sides of the plates are covered with a sheet of porous material, such as asbestos.

(1) 389,189. (2) 389,281. (3) 389,282. Electric Railway Trolleys; Josiah L. Blackwell, New York, N. Y. Applications filed respectively, July 3, 1888; May 24, 1888, and Aug. 9, 1888. These inventions relate to the construction of a trolley which will not cause the unpleasant noise usually heard when the vehicle is passing. The wheels of the trolley are made of non-resonant material, and supplemental collecting devices, such as brushes, are carried by the trucks.

389,187. Voltaic Armor; J. W. Baldwin, Boston, Mass., Assignor to Geo. A. Fullerton, of same place. Application filed May 28, 1888. To a suitable support is secured the elements alternately arranged, one element overlapping a tongue on the next adjacent one.



389,352. ALTERNATE CURRENT MOTOR.

(1) 389,196. (2) 389,197. Electric Motor; Electro-Magnetic Device; H. A. Chase, Stoneham, Mass. Application filed April 3, 1888. An electro-magnetic device, comprising a spool having a tubular shank, around which successive coils of wire are wound, a portion only of said shank being of magnetic material, combined with an armature placed within the tubular shank, one end of which lies in the field of force of the magnetic material. (2) The same device working double, with the necessary attachments.

389,207. Electric Motor; A. E. Eastwick, Detroit, Mich., Assignor by direct and mesne assignments of two-thirds to John T. Liggitt and Alva T. Hill, of same place. Application

filed Jan. 18, 1888. The spokes of the armature constitute the cores of the bobbins, each spoke being independently and separately made of strips of sheet metal engaged with a common head.

389,226. Electric Railway Signaling System; John Irwin, Topeka, Kan. Application filed Nov. 26, 1887. The train is fitted with apparatus for sending automatically signals to stations in the rear and ahead for indicating the position of the train on the road.

(1) 389,229. (2) 389,230. (1) Electrically Propelled Vehicle; (2) Motor Box for Electric Vehicles; Walter H. Knight, New York, N. Y. Applications filed respectively June 21, 1888, and May 10, 1888. (1) A pawl and ratchet device is geared to the axle to prevent backward movement of the vehicle when starting it on an up grade. (2) The motor is hung beneath the car outside the wheel base, and is inclosed by a housing provided with doors.

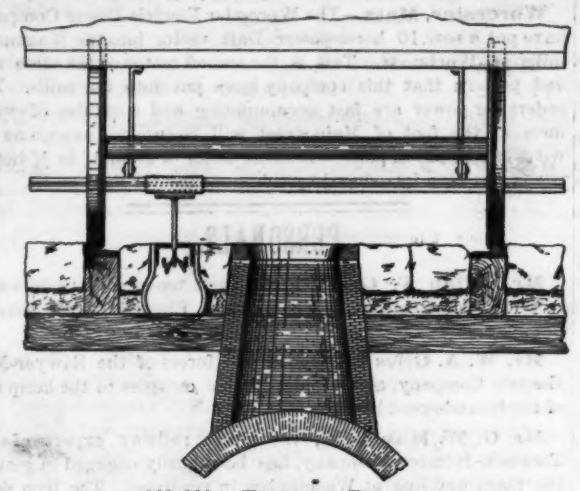
389,254. Switch for Electric Motors; George D. Shepardson, Granville, Ohio. Application filed April 30, 1888. This is an automatic switch for stopping a motor when a heavy short circuit or other practical cessation of the current on the main lines occurs. It often happens that the attendant is careless or ignorant of what should be done, or that he is unable to open the switch before the current is on again. The device consists of an electro-magnet and its armature, an armature lever carrying contacts, one or more springs co-operating with the said contacts, and a manual switch for cutting out the magnet.

389,265. Thermal Device for Varying Electric Resistance or Currents; Elihu Thomson, Lynn, Mass. Application filed Dec. 31, 1887. The movement of a body responsive to changes of temperature are utilized to change the position of the moving element of a variable resistance.

(1) 389,272. (2) 389,273. (3) 389,274. (1) Electrical Protective System; (2) Electrical Recording Mechanism; (3) Standard Tangent Galvanometer; Edward Weston, Newark, N. J. Applications filed respectively Jan. 23, 1888; March 10, 1888, and May 10, 1888. (1 and 2) The principle of these inventions is as follows: The organization of an apparatus or combination of instrumentalities whereby a safe or any other inclosed space or chamber may be protected from improper access by means of electrical mechanism, which shall operate upon a variation in the strength of the current traversing the circuit maintained between the place to be protected and the place at which warning or alarm is desired. (3) The instrument is constructed so that its coils, when placed on the instrument in their stationary position and on opposite sides of the central standard, shall be relatively parallel with their centre equidistant from the longitudinal axis of said standard, and disposed on a line intersecting said longitudinal axis at right angles. Within this standard is supported the magnet. It is necessary then simply to adjust the moveable magnet, so that its centre will be at the point of intersection, already permanently and exactly established. See illustration.

(1) 389,278. (2) 389,279. Electric Railways: Edward M. Bentley, New York, N. Y. Applications filed respectively Oct. 13, 1887, and Aug. 3, 1888. (1) By this invention a manhole or sewer trap may be located between the rails of a track and the electrical conduit built around the same. The collector is mounted upon the car so that it may move laterally when passing through the deflected portion of the conduit. (See ill.) (2) A transverse yoke supporting the slot rail is provided with a pocket which carries the insulator for the supply conductor.

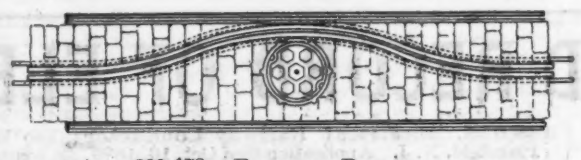
389,280. Electric Lamp Socket; S Bergmann, New York, N. Y. Application filed June 2, 1888. A switch wheel comprising spiral segmental surfaces is mounted loosely on the



389,278. ELECTRIC RAILWAY.

key-shaft. A spring clutch is arranged so that when the shaft is turned in one direction the wheel is moved also; but when moved in the opposite direction the wheel is released. Contact brushes bear upon the wheel.

389,297. Electric Lighting System; W. W. Griscom, Haverford College, Mass. Application filed June 30, 1888.



389,279. ELECTRIC RAILWAY.

An arrangement of apparatus, whereby every light of a series, may be simultaneously placed in circuit, at the same time obviating the necessity of breaking the circuit to any particular lamp at the individual switch.

389,314. Electric Conductors and Process of Uniting the Same; Charles McIntire, of Newark, N. J., Assignor of one-third to John A. Seely, of Brooklyn, N. Y. Application filed April 9, 1887. The end of one of the conductors is perforated; the end of the other is embraced by a clip. An extension on the clip is passed through the perforation, and the whole compressed by suitable pincers.

389,337. Telegraph Relay; F. Stitzel and C. Weinedel, Louisville, Ky., Assignors to the American Semaphore Company, of same place. Application filed Feb. 28, 1888. The armature itself is an electro-magnet placed in series with the main magnet. This is designed to be a very sensitive instrument.

389,352. Alternate Current Electric Motor; W. A. Anthony, of Manchester, Conn., and D. C. Jackson and H. J. Ryan, of Lincoln, Neb. Application field Feb. 24, 1888. The armature coils are permanently included in a closed circuit. The commutator plates are connected with different points in the length of the armature coils, and a closed circuit electrically unites the brushes. See illustration.

389,356. Reversing Switch and Rheostat for Electric Circuits; Charles G. Bickley, New York, N. Y. Application filed Oct. 29, 1887. The invention consists in a three-part switch, a series of adjustable resistance coils or bobbins, a contact-maker, and in details located in an electric circuit.

389,369. Incandescent Electric Lamp; Thomas A. Edison, Llewellyn Park, N. J. Application filed Feb. 6, 1888. In a multiple carbon lamp, the several loops are supported by means of a piece of insulating material connecting the upper ends of the loops.

389,421. Electric Gas Lighting Device; Wm. Tag and Sanford C. Smith, Philadelphia, Pa. Application filed Sept. 22, 1887. The movable member is attached to the gas-cock so that it will always be in a plane parallel to said cock.

389,423. Electro-Mechanical Gong; Jacob P. Tirrell, Boston, Mass., Assignor to the Electric Gas Lighting Company, of Portland, Me. Application filed Nov. 7, 1887. Clockwork which causes the movement of the hammer is released by an electro-magnet.

389,455. Electrode for Secondary Batteries; R. M. Elliott, Washington, D. C., Assignor of one-half to Louis Bagger, of same place. Application filed June 18, 1888. The active material in the form of a paste is first molded in the shape of a grating having lateral projections. The conducting and supporting material is then cast upon the outside of this.

389,526. Incandescent Electric Lamp; Frank Moore, Pittsburgh, Pa., Assignor to George Westinghouse, Jr., of same place. Application filed March 21, 1887. In an incandescent electric lamp a bulb having fragments of transparent or translucent material, and a coating of material infusible at the maximum temperature to which the lamp is exposed and insoluble in water, said coating securing the facing to the outer surface of the bulb.

389,532. Battery Jar; James Serson, of Boston, Mass, Assignor to James O. Whitten, of same place. Application filed Dec. 12, 1887. In the bottom of the cell a groove is formed for holding free mercury.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, N. Y.

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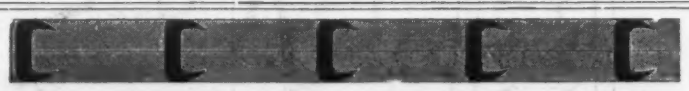

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